AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
J	1 of 62

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
0003	23-Aug-2002	W16ROE-2168-2014	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
USA ENGINEER DISTRICT, NEW YORK ATTN: CENAN-CT ROOM 1843 26 FEDERAL PLAZA (DACA51) NEW YORK NY 10278-0090	DACA51	**See Item 6**	

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
	X	9A. AMENDMENT OF SOLICITATION NO. DACA51-02-B-0019
	X	9B. DATED (SEE ITEM 11) 02-Aug-2002
		10A. MOD. OF CONTRACT/ORDER NO.
		10B. DATED (SEE ITEM 13)
CODE / FACILITY CODE		

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer [ ] is extended, [X] is not extended.

Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning 1 copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

[ ] A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

[ ] B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

[ ] C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

[ ] D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

The purpose of this amendment is to incorporate the attached changes being made to the drawings, specifications, and bid schedule. See page 2.

The bid opening date remains unchanged, 06 September 2002 at 2:00 PM.

All other terms and conditions in the original solicitation remains the same.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) TEL: EMAIL:	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)	16C. DATE SIGNED 23-Aug-2002

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

SUMMARY OF CHANGES

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0001	All work for the C-17 ADAL INTERIM FUEL CELL, BLDG. 1823 as described in the plans and specifications, complete.				
				NET AMT	

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0002		46	Linear Meter		
	Removal of asbestos containing magnesia pipe insulation				
				NET AMT	

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0003		46	Linear Meter		
	Removal of asbestos containing air cell pipe insulation				
				NET AMT	

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0004		12	Joint		

Removal of asbestos containing mudded joint packing pipe elbow insulation

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0005		1.10	Square Meter		

Removal of asbestos containing exterior duct and hangar door caulking

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0006		1			$5,000.00

All work for the Final Record Drawing Submission.

NET AMT

FOB: Destination

TOTAL LINE ITEMS #0001- 0006 $_____

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0007 OPTION	Optional Bid item 1 All work to provide wet pipe sprinkler system in the aircraft servicing bay as shown on the drawings. In the Base Bid, the only automatic fire suppression system in the aircraft servicing bay will be high expansion foam. The heat detection system associated with actuation of the high expansion foam system is deleted from the Base Bid if this option is taken				

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0008 OPTION	Optional Bid item 2 All work to provide water supply from Building 1837 to 1823, including piping, controls, trenching and backfill, and sidewalk and pavement repairs.				

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0009 OPTION	Optional Bid item 3 All work to provide a new fire hydrant as shown on the drawings				

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0010 OPTION	Optional Bid item 4 All work to paint all new or repaired materials associated with the work of this project.				

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0011 OPTION	Optional Bid item 5 All work to provide the trench ventilation system shown on the drawings.				

NET AMT

FOB: Destination

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0012 OPTION	Optional Bid Item 6 Additional work for the addition of a wood shadow-box type construction fence in lieu of a chain-link construction fence, and to paint the dumpsters, trash containers and temporary sanitation facilities, and contractor trailers, offices and storage buildings, the standard Base colors.				

NET AMT

FOB: Destination

SECTION 00010 - SOLICITATION CONTRACT FORM

CLIN 0013 is added as follows:

ITEM NO	SUPPLIES/SERVICES	QUANTITY	UNIT	UNIT PRICE	AMOUNT
0013 OPTION	Optional Bid Item 7 Provide continuous draft curtain fabricated from either corrugated metal or UL Listed fabric draft curtain system. This option item includes all equipment, service, labor and materials, such as integral fabric curtain boards, tape, frame, fasteners as well as related activities such as supplemental structural framing, sealing around pipes, existing structural members, etc., necessary for a complete system in compliance with applicable standards and manufacturer's requirements.				

NET AMT

FOB: Destination

TOTAL LINE ITEMS #0007- #0013 $_____

TOTAL LINE ITEMS #0001 - #0013 $_____

NOTES:

1. The low bidder for purposes of award will be the conforming responsible bidder offering the lowest amount for the Base Bid Item plus all Optional Bid Items.

2. The minimum construction award will be the amount bid for the Base Bid Item.

3. Bidders are required to bid on the Base Bid and all Optional Bid Items or their bids will be rejected.

4. Bidders are reminded that they must bid on the issued plans and specifications as amended. Any deviations, conditions or attachments made by the bidder himself thereto may render the bid non-responsive and be cause for its rejection.

5. The Optional Bid Items, if awarded, will each be awarded 120 days after the Base Bid Notice to Proceed date listed in Section 00800. The Government is under no obligation to award any of the Optional Bid Items.

INSPECTION AND ACCEPTANCE

The following Acceptance/Inspection Schedule was added for CLIN 0013:

INSPECT AT	INSPECT BY	ACCEPT AT	ACCEPT BY
N/A	N/A	N/A	Government

TO OFFERORS

The following changes shall be made to the drawings and specifications.

DRAWINGS

1.) The following DRAWINGS have been **REVISED but not REISSUED:**

a.) Sheet CS102
1 **REVISED** new fire water line size from 250mm to 300mm.
2 **ADD** the following General Note: "2. Exterior contractor staging is limited. Contractor's fenced area for construction staging shall be limited to an area approximately defined by the north edge parallel to the north edge of Building 1823, east edge as defined by the west side of Building 1823, west edge as indicted by the project limits on sheet CS102, and the south edge parallel to south face of Building 1823. Contractor shall provide minimum two gates on north and south ends of staging area centered on existing road. Final layout of exterior contractor staging area will be as approved by the Contracting Officer."

b.) Sheet CU101 – **REVISED** new fire water line size from 250mm to 300mm.

c.) Sheet CU102 – **REVISED** new fire water line size from 250mm to 300mm.

d.) Sheet AD101
1 **DELETE** KEYED NOTE 02220.18 between column grids 7 and 8, and A and B and H and J.
2 **CHANGE** KEYED NOTE 02220.15 to read "REMOVE ALUMINUM FRAME, GLAZING, PRECAST CONCRETE WALL PANEL & CONCRETE CURB (PRECAST CONCRETE WALL PANEL & CONCRETE CURB TO BE SAWCUT AND REMOVED AT DOOR LOCATION ONLY)".
3 **CHANGE** KEYED NOTE 02220.24 to read "REMOVE EXISTING CEILING TO INSTALL NEW FIRE SPRINKLER PIPING".

e.) Sheet AE101
1 **DELETE** KEYED NOTES 02220.24 and 05120 from KEYED NOTE LIST.
2 **CHANGE** KEYED NOTE 01000.14 to "INSTALL NEW SUSPENDED CEILING TO MATCH ORIGINAL CEILING TYPE IN AREAS WHERE CEILING WAS REMOVED FOR FIRE SPRINKLER INSTALLATION".
3 **CHANGE** KEYED NOTE DESIGNATOR 02220.24 (four locations) on GROUND FLOOR PLAN TO 01000.14.
4 **ADD** KEYED NOTE DESIGNATOR 01000.14 in area of stairway on SECOND FLOOR PLAN.

f.) Sheet AE201
1 **CHANGE** detail reference on KEYED NOTE 01000.22 from "5/MH401" to "5/M-501".
4 **CHANGE** KEYED NOTE 02220.15 to read "REMOVE ALUMINUM FRAME, GLAZING, PRECAST CONCRETE WALL PANEL & CONCRETE CURB (PRECAST CONCRETE WALL PANEL & CONCRETE CURB TO BE SAWCUT AND REMOVED AT DOOR LOCATION ONLY)".

g.) Sheet AE301:
1 **CHANGE** KEYED NOTE 05120.19 to 05500.02 "BENT STEEL PLATE (100mmX100mmX6mm) – ANCHOR TO CMU WALL @ 1200 mm O.C.).

h.) Sheet AE601:
1 **DELETE** KEYED NOTE 05500.12 HEADED STUDS.
2 **ADD** KEYED NOTE 08110.06 "FRAME ANCHOR".

3 Details D1 and D4: **CHANGE** KEYED NOTE "05500.12" to "08110.06".
4 Detail D7 and D9 – **CHANGE** break metal, KEYED NOTE 05500.62, from three pieces, one on end of CMU and two against aluminum frame/precast panel, to one "zig-zag" shaped piece on each side to cover gyp. bd. and exposed end of CMU and with the ends wrapping around CMU and gyp. bd. at aluminum frame/precast panel. Attach with pan head screws.
ADD vertical steel angle, (76x76x4.8) at each corner of end of CMU walls and weld all around to existing girts.
5 **CHANGE** KEYED NOTE 07900.02 to "SEALANT W/ BACKER ROD".
6 **CHANGE** KEYED NOTE 09250.26 to "92mm STEEL STUDS W/ 16mm GYP. BD. EA. SIDE.

i.) Sheet S-001:
1 **DELETE** soils information in General Notes.
2 **REVISE** concrete strength at continuous footings to 20.7 MPa, and at all other structural concrete to 27.6 MPa.
3 **REPLACE** "1996 Edition" with "2000 Edition" in Steel Construction Note #8.
4 **REPLACE** "200 mm" with "250 mm" in Steel Construction Note #11.
5 **REPLACE** "AWS D1.1-96" with "AWS D1.1-00" in Steel Construction Note #14.
6 **CHANGE** "25 MPa pea-gravel concrete" to "Grout meeting the requirements of ASTM C 476" in Reinforced Hollow CMU Note #3.
7 **CHANGE** "50 mm x 75 mm" to "100 mm x 140 mm" in Reinforced Hollow CMU Note #4.
8 **CHANGE** "600 mm or 40 bar diameters" to "600 mm or 48 bar diameters" in Reinforced Hollow CMU Note #5.
9 Detail 2/S-001, Notes in box: **ADD "**Note #6, Provide 2-16 mm vertical bars in grouted cells at 1219 mm maximum spacing along entire length of wall."

j.) Sheet M-001:
1 **ADD** the following Abbreviation:

"EXHAUST REGISTER…….ER"

e.) Sheet MH102:
1 **ADD** the following GENERAL NOTES:

"2. ALL POSITIVE PRESSURE DUCTWORK FOR EF-3 AND EF-4 SHALL HAVE A 1000 Pa PRESSURE CLASSIFICATION.
3. ALL NEGATIVE PRESSURE DUCTWORK FOR EF-3 AND EF-4 SHALL HAVE A -1000 Pa PRESSURE CLASSIFICATION."
2 **ADD** the words "(OPTION NO. 1)" under the note "AREA TEMPERATURE SENSOR (TYP) FOR WET PIPE SPRINKLER SYSTEM" between Grids 5, 6 and G, H.
3 **CHANGE** "8 MM HARDWARE CLOTH" to "8 MM MESH OPENING AND 1 MM WIRE DIAMETER ALUMINUM OR GALVANIZED STEEL BIRDSCREEN" in notes between Grids 7, 8 at east and west sides of building.

f.) Sheet MH401:
1 **ADD** the following GENERAL NOTE:
"THE WET PIPE SPRINKLER SYSTEM DIGITAL TEMPERATURE MONITORING SYSTEM IS PART OF OPTION NO. 1."

g.) Sheet M-501:
CHANGE Sheet Reference in all Detail Symbols to "M-501".
Detail No. 1 "TYPICAL FUEL MAINTENANCE TRENCH EXHAUST":
a **CHANGE** the exhaust register description from "450MMx450MM-A" to "450x450-ER".
b **ADD** "3.5 MM DIA." upstream and downstream of 100 mm dia. exhaust duct connection."
c **CHANGE** "UP TO EXHAUST FAN ON MEZZANINE. SEE PLANS FOR SIZE" to "UP TO EXHAUST FAN ON PLATFORM."

Detail No. 2 “TRENCH EXHAUST DUCT DETAIL, SECTION “A”: **CHANGE** the words “LAG BOLT” on duct supports to “EXPANSION ANCHOR AND 304 STAINLESS STEEL BOLT”.
Detail No. 4: **ADD** "305 MM DIA." to utility set inlet duct.
Detail No. 5: **ADD** the following note: "CONTRACTOR SHALL PROVIDE MOUNTING FRAME, IF REQUIRED, TO MOUNT EXHAUST FAN TO STEEL ANGLE FRAMING. REFER TO SHEET AE201."
Detail No. 6, Detail Title: **CHANGE** "DETAO;" to "DETAIL".
Detail No. 7:
a **ADD** "ELECTRIC 2-WAY NORMALLY CLOSED CONTROL VALVE VLV-01-01" to the HTWR line between the gate valve and balancing valve.
b **DELETE** the balancing valve and replace with a globe valve.
ADD the following note:
"Note: DETAIL NOS. 1, 2, 3, 4 AND 8 ARE PART OF OPTIONAL BID ITEM NO. 5."

h.) Sheet M-701:
1 Detail 1: The abbreviation "HC" indicates a Heating Coil. **CHANGE** "HR" to "HTWR". **CHANGE** "HS" to "HTWS".
2 Detail 1, UH-1 Thermostat Schedule: **CHANGE** the space from “MECHANICAL ROOM “ to “EQUIPMENT RM. 100”.

j.) Sheet FP301:

1 **CHANGE** all Sheet References in all Detail Symbols to "FP301".
2 **ADD** General Note #2 as follows:
"2. Provide new draft curtain at Grid 5 as Option No. 7 in accordance with one of the following descriptions:
a Steel panel curtain: Provide continuous steel panel draft curtain consisting of the following construction:
1) Cold-formed 50 x 100 x 1.9 mm continuous angle attached to the bottom flange of the existing purlins with #14 self-drilling screws at 300 mm o.c.
2) HSS 100 x 100 x 3 mm continuous spanning between, and welded to, truss bottom chords.
3) 0.55 mm corrugated steel panels spanning vertically between cold-formed steel angle at top chord and square tube at bottom. Fasten panels with #14 self-drilling screws at 300 mm o.c. Fasten panel side laps with #12 self-drilling screws at 600 mm o.c.
4) Install curtain plumb under purlin with tube offset from bottom cross brace member.
b Fabric panel curtain: Provide continuous fabric panel draft curtain consisting of the following construction:
1) Framework shall be galvanized steel tubes at top, ends, intermediate verticals sized and spaced to resist a load on fabric panel of 4950 kPa.
2) Fabric shall be manufacturer's standard fire resistant fabric meeting UL and FM classifications, ASTM E 84 Tunnel Test, ASTM E 662 Smoke Density Test, and NFPA small and large scale tests, and the following:
Fabric construction
Warp (MDY Yarns): 58 +/- 2 ends/25 mm ECDE 75
1/0 Fill (XMDY Yarns): 42 +/- 2 picks/25 mm ECDE 75 1/0
Breaking Strength:
Warp: 4.5 kg/mm min.
Fill: 3.6 kg/mm min.
Elmendorf Tear Strength:
Warp: 6.4 kg min.
Fill: 6.4 kg min.
Weight:
Uncoated: 8.0 +/- 0.3 OSY
Coated: 9.5 +/- 0.7 OSY

Air Permeability: 0.0005 m^3/s

3) Attachment Fastener Clips: Tempered spring steel with slots to slide over steel member flange and teeth to hold clip in place.
4) Install curtain between roof purlin and bottom cross brace member.
5) Suggested Manufacturer: FabricLock as manufactured by Smoke & Fire Prevention Systems, Clarksville, VA, (800) 991-1352, or approved equal.

k.) Sheet FP501: Detail 1: Delete piping above FDC connection point to riser. This piping is shown in section on Sheet FP301.

l.) Sheet FP601:
1 **REVISE** note describing fire pumps in Building 1837 at top of sheet as follows: "5 @ 157.72 L/S, 862 kPa RATED EXISTING FIRE PUMPS, 4 OPERATING AND 1 STANDBY. PATTERSON 8X6YS WITH 2100 DDFP-L6FA DIESEL ENGINE AND HUBBELL- LX2000 CONTROLLER."
2 **REPLACE "**TEST AND DRAIN" note after hangar and support area flow switch at lower center area of detail with "PROVIDE INSPECTOR'S END OF LINE TEST CONNECTION".

m.) Sheet EP101:
1 **ADD** "(Option No. 1)" to TEMPERATURE MONITORING CONTROLLER Note between Grids B, C and 1, 2.

n.) Sheet EY101
1 **ADD** "(Option No. 1)" to Note 8.

2.) The following DRAWINGS have been **REISSUED:**

a.) Sheet CU103, Revision 1.

b.) Sheet CU501, Revision 1.

c.) Sheet MH101, Revision 1.

d.) Sheet FP201, Revision 1.

e.) Sheet FP401, Revision 1.

f.) Sheet FP502, Revision 1.

g.) Sheet EY601, Revision 1.

SPECIFICATIONS

1.) The following SPECIFICATIONS SECTIONS have been **ADDED** in their entirety and are provided in their entirety herein:

a.) 02760A – FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENT

2.) The following SPECIFICATIONS SECTIONS have been **DELETED** in their entirety and **REPLACED** with new herein:

Section 13966, Fire Protection System - Wet Pipe Sprinkler System and High Expansion Foam (HEF) dated 21 August 2002.

3.) The following SPECIFICATIONS have been **REVISED** as indicated below.

Section 00010, Bid Schedule

THE PRICE SCHEDULE ISSUED IN THE SPECIFICATIONS IS **DELETED** IN ITS ENTIRETY AND **REPLACED** WITH THE REVISED PRICE SCHEDULE THAT ACCOMPANIES.

Section 00800, Special Contract Requirements

ADD the following sentence to Paragraph 1.x.1:

"The Contractor will be allowed to use the hangar bay for additional laydown, shakeout and storage, as well as dumpsters, trash containers, temporary sanitation facilities, contractor trailers, offices and storage buildings."

DELETE the first sentence of Paragraph 1.x.2 and **REPLACE** with the following.

"Contractor is limited to 4 trailers within the Construction Limit confines, including the hangar bay. If Contractor chooses to use hangar bay for his use, he shall provide adequate protection to prevent damage to hangar bay floor and adjacent walls, utilities and equipment."

Section 01355A, Environmental Protection

Paragraph 3.4.1 – **REVISE** 3rd sentence to delete “baghouse, scrubbers, electrostatic precipitators”.

Paragraph 3.5.5(c) – **REVISE** “discharged into the sanitary sewer with prior approval and/or notification to the Waste Water Treatment Plant’s Operator.” to “coordinated with the Base Environmental Officer.”

Section 02220, Demolition

Paragraph 1.2 – **REVISE** last sentence as follows, “…maximum extent possible;” and **DELETE** “in accordance with Section 01572 CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT, if applicable;”

Section 02316A, Excavation, Trenching, and Backfilling for Utilities Systems

Paragraph 3.1 – **DELETE** the 2nd and 3rd sentence (references to rock excavation).

Paragraph 3.1 – **REVISE** 5th sentence, change “compactor” to “contractor”.

Paragraph 3.3.1 – **REVISE** 1st sentence from “1.32 meters” to “1321 mm”.

Section 02510A, Water Distribution System

Paragraph 1.1 – Concerning piping, **DELETE** all references not pertaining to Ductile-Iron and High Density Polyethylene (HDPE) pipes.

Paragraph 1.1- **ADD** the following references pertaining to HDPE pipe:

"ASTM D 638 Standard Test Method for Tensile Properties of Plastics

ASTM D 696	Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer
ASTM D 746	Standard Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam
ASTM D 790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D 1238	Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
ASTM F 1473	Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins
ASTM D 1505	Standard Test Method for Density of Plastics by the Density-Gradient Technique
ASTM D 1603	Standard Test Method for Carbon Black In Olefin Plastics
ASTM D 2240	Standard Test Method for Rubber Property—Durometer Hardness
ASTM D 2837	Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials"

Paragraph 1.4 – SD 07 Certificates, **REVISE** from "…PE, RTRP, and/or RPMP" to "**HD**PE pipe laying".

Paragraph 2.5 – **DELETE** all references to concrete valve boxes in first and fourth sentences.

Paragraph 3.1.4.1 – **DELETE** first and last sentences CHANGE "PE" to "HDPE".

Paragraph 3.1.5.2 – **DELETE** entire paragraph.

Paragraph 3.1.5.3 – **DELETE** "and push-on type"

Paragraph 3.2.1 – **CHANGE** the words from "subjected for….", to the end of the paragraph to "subjected to hydrostatic pressure tests in accordance with NFPA 24, Section 9-2."

Paragraph 3.2.2 – **DELETE** all sentences after the first in first paragraph and formula with notes. **ADD** "Each leakage test for fire water piping designated on the drawings shall be conducted in accordance with NFPA 24, Section 9-2. Leakage for fire water lines is defined in NFPA 24, Section 9-2."

In the second Paragraph, **CHANGE** the words "calculated by the above formula" to "required by NFPA 24".

Paragraph 3.3.1 – **ADD** "Flushing and" to the paragraph title. DELETE "as prescribed by AWWA C651" in the first sentence. After the second sentence, **ADD** "Fire water lines shall be flushed in accordance with NFPA 24, Section 9-1." **DELETE** the last sentence.

Section 02531A, Sanitary Sewers

Paragraph 1.1 – **DELETE** all references not pertaining to PVC or Cast Iron pipe.

Paragraph 2.1.2 – In 1st sentence **DELETE**, "Class SV, except where".

Paragraph 2.2.1 – **DELETE** "ABS and".

Paragraph 2.3.1 – **DELETE** "or high-density polyethylene pipe"

Paragraph 2.3.2 – **DELETE** all but 1st sentence.

Paragraph 2.4 – In the 2nd sentence, **DELETE** "ABS" and "saddles for ABS pipe shall comply with Table 3 of ASTM D 2751;"

Paragraph 2.5 – **DELETE** all of paragraph.

Paragraph 3.1.1.2 – In 1st sentence, **DELETE**, ", the sewer pipe shall be sleeved as specified above".

Paragraph 3.1.2 – **DELETE** all of part d and part e.

Paragraph 3.1.2.1 – **DELETE** all of paragraph.

Paragraph 3.1.3 – **DELETE** the 2nd, 3rd, and 5th sentences.

Paragraph 3.1.4 – In the 3rd sentence, **DELETE** ", but 95 percent for RPMP and RTRP" and in the 9th sentence, delete "or 5 percent for RTRP and RPMP,".

Section 02754A, Concrete Pavements for Small Projects

Paragraph 3.7.1.1 – **DELETE** "at the required spacing" in the 4th sentence and **REPLACE** with "transverse to the pavement every 4.5 meters".

ADD Paragraph 3.7.2 Expansion Joint

"Expansion joints shall be constructed in accordance with Section 02770A and shall be a width of 19 mm, full depth, placed every 18 meters. Expansion material shall meet the requirements of ASTM D 1752."

Section 02922A, Sodding

Paragraph 3.9.1 – **DELETE** the 3rd sentence (references to 02921A, 02923A and 02930A).

Section 08110, Steel Doors and Frames

ADD the following after Paragraph 2.5.1, second sentence:

"Close backs of jambs and continuously weld and grind smooth."

DELETE from Paragraph 2.5.2 the words "not lighter than 1.2 mm thick".

CHANGE Subparagraph under Paragraph 2.5.2.1 from "c" to "a", and **CHANGE** the word "girts" to "channels".

Section 09900, Paints and Coatings

ADD the following after Paragraph 1.9, second sentence:

"All exterior colors shall be custom colors to match McGuire AFB Standard colors."

ADD the following subparagraph to Paragraph 1.10.1.1:

"a. All unfinished exterior items, or prefinished exterior items not painted McGuire AFB Standard colors, shall be painted or repainted a custom color to match McGuire AFB Standard colors."

DELETE subparagraph 1.10.2.e in its entirety and **REPLACE** with the following:

"e. Hardware, fittings, and other factory finished items, unless indicated otherwise."

Section 15070N, Mechanical Sound, Vibration, and Seismic Control

DELETE TABLE 1A in Paragraph 1.4.5 Machinery Vibration Criteria and **REPLACE** with the following:

"TABLE 1A

Vibration Isolator Types and Minimum Static Deflection
(MSD, mm) for 100-200 mm slab on grade and column supported.

Column Spacing	Slab on earth and 0-9 meter		9.1-12 meters		12.1-15 meters	
Equipment	Type	MSD (Note (1))	Type	MSD (Note (1))	Type	MSD (Note (1))
Utility Fans	S-R	20				
Platform-Mounted (EF-3 and EF-4)"						

Section 15080N, Mechanical Insulation

ADD the following Paragraph:
"2.1.1 Piping Insulation Jackets

2.1.1.1 All-Purpose Jacket

Provide insulation with insulation manufacturer's standard reinforced fire retardant jacket with or without integral vapor barrier as required by the service. Provide jackets in exposed locations with a white surface suitable for field painting."

Section 15184N, HIGH TEMPERATURE WATER SYSTEM WITHIN BUILDING

Paragraph 1.4: **DELETE** in SD-02 Shop Drawings, reference to MTW and **DELETE** brackets.

Section 15400N, Plumbing Systems

Paragraph 2.4: **DELETE** paragraph in its entirety.

Section 15801N, Industrial Ventilation and Exhaust

Paragraph 1.4.4: **DELETE** the words “and Section 15951N, “Testing Industrial Ventilation Systems””.

Paragraph 2.2.6.2: **ADD** after the words “trench drain exhaust joints”, the words “from low point of ductwork to 200 mm above finished floor”.

Paragraph 3.2: **ADD** the following subparagraph:

"3.2.6 Ductwork Structural Integrity and Leakage Testing

Inspect and test systems pressure rated higher than 498 Pa gage for structural integrity and leakage as systems or sections during construction but after erection, as work progresses, in system or section lengths not exceeding 30 meters. Test for structural integrity at 50 percent in excess of system fan positive or negative total pressure. Test for leakage at 50 percent in excess of system fan positive or negative total pressure. Leakage test procedure and apparatus shall be in accordance with SMACNA Leakage Test Mnl. Total leakage, prorated to length of duct under test, shall not exceed one percent of system capacity. Do not permit leakage in positive pressure ducts in buildings carrying flammable or toxic materials."

Section 15810N, Ductwork and Ductwork Accessories

Paragraph 1.5: **ADD** "registers" under SD-01 Preconstruction Submittals

Section 15950N, HVAC Testing/Adjusting/Balancing

Paragraph 3.2.4: **DELETE** Paragraph in its entirety.

Paragraph 3.2.6.3: **DELETE** Paragraph in its entirety.

Paragraph 3.2.6.5: **DELETE** Paragraph in its entirety.

Section 13851A, Fire Detection And Alarm System, Addressable

Paragraph 2.5.1.1: **ADD** "(Option No. 1)" to LINE-TYPE FIXED TEMPERATURE

SECTION 02760A

FIELD MOLDED SEALANTS FOR SEALING JOINTS IN RIGID PAVEMENTS
03/97

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in this text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 509	(1994) Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D 789	(1998) Determination of Relative Viscosity and Moisture Content of Polyamide (PA)

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS SS-S-200	(Rev E; Am 2) Sealant, Joint, Two-Component, Jet-Blast-Resistant, Cold-Applied, for Portland Cement Concrete Pavement

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Manufacturer's Recommendations; G.

Where installation procedures, or any part thereof, are required to be in accordance with the manufacturer's recommendations, printed copies of these recommendations, 30 days prior to use on the project. Installation of the material will not be allowed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

Construction Equipment List; G.

List of proposed equipment to be used in performance of construction work including descriptive data, 30 days prior to use on the project.

SD-04 Samples

Materials; G.

Samples of the materials (sealant, primer if required, and backup material), in sufficient quantity for testing and approval 30 days prior to the beginning of work. No material will be allowed to be used until it has been approved.

1.3 TEST REQUIREMENTS

The joint sealant and backup or separating material shall be tested for conformance with the referenced applicable material specification. [Testing of the materials shall be performed in an approved independent laboratory and certified copies of the test reports shall be submitted and approved 30 days prior to the use of the materials at the job site. Samples will be retained by the Government for possible future testing should the materials appear defective during or after application.] Conformance with the requirements of the laboratory tests specified will not constitute final acceptance of the materials. Final acceptance will be based on the performance of the in-place materials.

1.4 EQUIPMENT

Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and shall be maintained in satisfactory condition at all times.

1.4.1 Joint Cleaning Equipment

1.4.1.1 Concrete Saw

A self-propelled power saw with water-cooled diamond or abrasive saw blades will be provided for cutting joints to the depths and widths specified or for refacing joints or cleaning sawed joints where sandblasting does not provide a clean joint.

1.4.1.2 Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hose, and long-wearing venturi-type nozzle of proper size, shape and opening. The maximum nozzle opening should not exceed 6.4 mm. The air compressor shall be portable and shall be capable of furnishing not less than 71 liters per second and maintaining a line pressure of not less than 621 kPa at the nozzle while in use. Compressor capability under job conditions must be demonstrated before approval. The compressor shall be equipped with traps that will maintain the compressed air free of oil and water. The nozzle shall have an adjustable guide that will hold the nozzle aligned with the joint approximately 25 mm above the pavement surface. The height, angle of inclination and the size of the nozzle shall be adjusted as necessary to secure satisfactory results.

1.4.1.3 Hand Tools

Hand tools may be used, when approved, for removing defective sealant from a crack and repairing or cleaning the crack faces.

1.4.2 Sealing Equipment

1.4.2.1 Two-Component, Cold-Applied, Hand-Mix Sealing Equipment

Mixing equipment for FS SS-S-200 Type H sealants shall consist of a slow-speed electric drill or air-driven mixer with a stirrer in accordance with the manufacturer's recommendations.

1.5 TRIAL JOINT SEALANT INSTALLATION

Prior to the cleaning and sealing of the joints for the entire project, a test section of at least 60 m long shall be prepared using the specified materials and approved equipment, so as to demonstrate the proposed joint preparation and sealing of all types of joints in the project. Following the completion of the test section and before any other joint is sealed, the test section shall be inspected to determine that the materials and installation meet the requirements specified. If it is determined that the materials or installation do not meet the requirements, the materials shall be removed, and the joints shall be recleaned and resealed at no cost to the Government. When the test section meets the requirements, it may be incorporated into the permanent work and paid for at the contract unit price per linear foot for sealing items scheduled. All other joints shall be prepared and sealed in the manner approved for sealing the test section.

1.6 DELIVERY AND STORAGE

Materials delivered to the job site shall be inspected for defects, unloaded, and stored with a minimum of handling to avoid damage. Storage facilities shall be provided by the Contractor at the job site for maintaining materials at the temperatures and conditions recommended by the manufacturer.

1.7 ENVIRONMENTAL CONDITIONS

The ambient air temperature and the pavement temperature within the joint wall shall be a minimum of 10 degrees C and rising at the time of application of the materials. Sealant shall not be applied if moisture is observed in the joint.

PART 2 PRODUCTS

2.1 SEALANTS

Materials for sealing cracks in the various paved areas indicated on the drawings shall be as follows:

Area	Sealing Material
ALL	FS SS-S-200 Type H

2.2 PRIMERS

Primers, when their use is recommended by the manufacturer of the sealant, shall be as recommended by the manufacturer of the sealant.

2.3 BACKUP MATERIALS

The backup material shall be a compressible, nonshrinking, nonstaining, nonabsorbing material and shall be nonreactive with the joint sealant. The material shall have a melting point at least 3 degrees C greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The material shall have a water absorption of not more than 5 percent of the sample weight when tested in accordance with ASTM C 509. The backup material shall be 25 plus or minus 5 percent larger in diameter than the nominal width of the crack.

2.4 BOND BREAKING TAPES

The bond breaking tape or separating material shall be a flexible, nonshrinkable, nonabsorbing, nonstaining, and nonreacting adhesive-backed tape. The material shall have a melting point at least 3 degrees C greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D 789. The bond breaker tape shall be approximately 3 mm wider than the nominal width of the joint and shall not bond to the joint sealant.

PART 3 EXECUTION

3.1 PREPARATION OF JOINTS

Immediately before the installation of the sealant, the joints shall be thoroughly cleaned to remove all laitance, curing compound, filler, protrusions of hardened concrete, and old sealant from the sides and upper edges of the joint space to be sealed.

3.1.1 Facing of Joints

Facing of joints shall be accomplished using a concrete saw as specified in paragraph EQUIPMENT. The blade shall be stiffened with a sufficient number of suitable dummy (used) blades or washers. Immediately following the sawing operation, the joint opening shall be thoroughly cleaned using a water jet to remove all saw cuttings and debris.

3.1.2 Sandblasting

The newly exposed concrete joint faces and the pavement surfaces extending a minimum of 13 mm from the joint edges shall be sandblasted clean. A multiple-pass technique shall be used until the surfaces are free of dust, dirt, curing compound, filler, old sealant residue, or any foreign debris that might prevent the bonding of the sealant to the concrete. After final cleaning and immediately prior to sealing, the joints shall be blown out with compressed air and left completely free of debris and water.

3.1.3 Back-Up Material

When the joint opening is of a greater depth than indicated for the sealant depth, the lower portion of the joint opening shall be plugged or sealed off using a back-up material to prevent the entrance of the sealant below the specified depth. Care shall be taken to ensure that the backup material is placed at the specified depth and is not stretched or twisted during installation.

3.1.4 Bond Breaking Tape

Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, a bond breaker separating tape will be inserted to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. The tape shall be securely bonded to the bottom of the joint opening so it will not float up into the new sealant.

3.1.5 Rate of Progress of Joint Preparation

The stages of joint preparation which include sandblasting, air pressure cleaning and placing of the back-up material shall be limited to only that lineal footage that can be sealed during the same day.

3.2 PREPARATION OF SEALANT

3.2.1 Type H Sealants

The FS SS-S-200 Type H sealant components shall be mixed either in the container furnished by the manufacturer or a cylindrical metal container of volume approximately 50 percent greater than the package volume. The base material shall be thoroughly mixed in accordance with the manufacturer's instructions. The cure component shall then be slowly added during continued mixing until a uniform consistency is obtained.

3.3 INSTALLATION OF SEALANT

3.3.1 Time of Application

Joints shall be sealed immediately following final cleaning of the joint walls and following the placement of the separating or backup material. Open joints that cannot be sealed under the conditions specified, or when rain interrupts sealing operations shall be recleaned and allowed to dry prior to installing the sealant.

3.3.2 Sealing Joints

Immediately preceding, but not more than 15 m ahead of the joint sealing operations, a final cleaning with compressed air shall be performed. The joints shall be filled from the bottom up to 3 mm plus or minus 1.5 mm below the pavement surface. Excess or spilled sealant shall be removed from the pavement by approved methods and shall be discarded. The sealant shall be installed in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the Contracting Officer. When a primer is recommended by the manufacturer, it shall be applied evenly to the joint

faces in accordance with the manufacturer's instructions. Joints shall be checked frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

3.4 INSPECTION

3.4.1 Joint Cleaning

Joints shall be inspected during the cleaning process to correct improper equipment and cleaning techniques that damage the concrete pavement in any manner. Cleaned joints shall be approved prior to installation of the separating or back-up material and joint sealant.

3.4.2 Joint Sealant Application Equipment

The application equipment shall be inspected to ensure conformance to temperature requirements, proper proportioning and mixing (if two-component sealant) and proper installation. Evidences of bubbling, improper installation, failure to cure or set shall be cause to suspend operations until causes of the deficiencies are determined and corrected.

3.4.3 Joint Sealant

The joint sealant shall be inspected for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified herein at no additional cost to the Government.

3.5 CLEAN-UP

Upon completion of the project, all unused materials shall be removed from the site and the pavement shall be left in a clean condition.

-- End of Section --

SECTION 13966

WET PIPE WATER SPRINKLER WITH
HIGH EXPANSION FOAM (HEF), FIRE PROTECTION SYSTEM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M	(2001) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 795	(2000) Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
ASTM D 2996	(1995) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Pipe

AMERICAN WATER WORKS ASSOCIATION(AWWA)

AWWA B300	(1999) Hypochlorites
AWWA B301	(1992; Addenda B301a - 1999) Liquid Chlorine
AWWA C104	(1995) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C110	(1998) Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm through 1200 mm), for Water and Other Liquids
AWWA C111	(2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C151	(1996) Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids
AWWA C203	(1997; Addenda C203a - 1999) Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot-Applied
AWWA EWW	(1999) Standard Methods for the Examination of Water and Wastewater
AWWA M20	(1973) Manual: Water Chlorination Principles and Practices

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A13.1	Scheme for Identification of Piping Systems

ASME INTERNATIONAL (ASME)

ASME B31.3	(1996) Process Piping
ASME BPVC VIII D1	(1995; Addenda 1995, 1996, and 1997) Boiler and Pressure Vessel Code: Section VIII Pressure Vessels, Division 1

ENGINEERING TECHNICAL LETTER (ETL)

ETL 01-2	(2001) Fire Protection Engineering Criteria - New Aircraft Hangars

FACTORY MUTUAL ENGINEERING AND RESEARCH (FM)

FM P7825a	(1998) Approval Guide Fire Protection
FM P7825b	(1998) Approval Guide Electrical Equipment

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)

IEEE C62.41	(1991; R 1995) Surge Voltages in Low-Voltage AC Power Circuits

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 11A	(1999) Medium and High Expansion Foam Systems
NFPA 13	(1999) Installation of Sprinkler Systems
NFPA 24	(1995) Installation of Private Fire Service Mains and Their Appurtenances
NFPA 70	(2002) National Electrical Code
NFPA 72	(1999) National Fire Alarm Code
NFPA 170	(1999) Fire Safety Symbols
NFPA 409	(2001) Aircraft Hangars
NFPA 1963	(1998) Fire Hose Connections

UNDERWRITERS LABORATORIES (UL)

UL 1449	(1996; Rev thru Dec 1999) Transient Voltage Surge Suppressors
UL Fire Prot Dir	(1999) Fire Protection Equipment Directory

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL HDBK 1008C	(1997) Fire Protection for Facilities Engineering, Design, and Construction

1.2 SCOPE OF WORK

a. Provide a wet pipe water sprinkler protection for the entire building, including shops, offices and the aircraft servicing area, in accordance with ETL 01-2 and MIL HDBK 1008C.

1) Provide the number of wet pipe water sprinkler systems as indicated on the drawings, and in accordance with NFPA 13. Sprinkler system risers shall be located as indicated on the drawings.

2) Design the sprinkler systems in accordance with the following criteria:

a) The systems for the aircraft servicing area shall provide a minimum density of 8.0 lpm/m^2 over the most hydraulically remote design area of 605 m^2, as indicated in ETL 01-2, including the additional 30% area applied due to the roof slope.

b) The systems for the remainder of the building shall provide a minimum density in accordance with the area hazard classification per NFPA 13 and MIL HDBK 1008C.

c) Hydraulic calculations per NFPA 13 and NFPA 11A are required. High expansion foam system flow shall be included.

d) Contractor shall design and provide pipe supports, hangers and sway bracing as required by these specifications.

e) Contractor's shop drawings and record drawings shall contain all information required by NFPA 13 for working drawings.

f) Contractor's shop drawings and calculations for all portions of the work are included in the Base Bid. Installation of the Existing Hangar piping and sprinklers downstream of the sectional control valve is included in Option 1. All other piping and equipment is in the Base Bid, and shall be installed per the calculations to accept installation of the hangar servicing bay sprinklers, either with Option 1 or at a later date.

b. Provide a high expansion foam (HEF) system to protect all areas of the aircraft servicing area (hangar bay) as shown on the drawings.

1) The low level high expansion foam system shall be provided in conjunction with the wet pipe sprinkler system. The high expansion foam system shall meet the requirements of ETL 01-2. The system shall be actuated by either water flow from the wet pipe sprinkler system or by manual pull. The Contractor shall design all portions of the sprinkler system including installation details, piping, and equipment. Pipe and equipment sizes shall be confirmed by hydraulic calculations.

2) The HEF system shall be hydraulically designed in accordance with the local application rate requirements of NFPA 11A or a minimum of 0.8 $m^3/min/m^2$ over the entire hangar, using either inside or outside air. Foam shall cover 90 percent of the silhouette of the aircraft in one minute, and the entire hangar to a depth of 1 m in four minutes. Performance testing as described in Part 3 of this specification shall also be satisfactorily completed. Hydraulic calculations shall be in accordance with the Area/Density Method of NFPA 13. Water velocity in the piping above grade shall not exceed 6 m/s.

3) Provide an HEF proportioning system with HEF concentrate for initial tank filling, testing, and refilling at the conclusion of final acceptance testing. HEF concentrate tank shall have the capacity required by the calculations. A reserve supply of HEF concentrate is not required.

c. Provide water supply for fire protection systems from Building 1837 in accordance with ETL 01-2 and NFPA 24. Flush and test systems. Before submitting calculations, flow test five existing fire pumps in Building 1837 in accordance with NFPA 20, Paragraph 11-2.6, using calibrated equipment, and by a PE or NICET IV, in the presence of the Base Fire Chief. Coordinate testing with the Fire Chief and pump and controller manufacturer. Flow, rpm, suction and discharge pressure readings shall be taken at each point. Submit written plan and schedule for testing to Contracting Officer 14 days before testing is to begin. Forward test data to the Fire Chief and the Contracting Officer and include with hydraulic calculations and O&M manuals.

d. Basis for Calculations: The design of the system shall be based on the water supply provided at Building 1837. Hydraulic calculations shall be based upon the Hazen-Williams formula with a "C" value of 120 for galvanized steel piping, 140 for new cement-lined ductile-iron piping, 150 for new HDPE piping and 100 for existing underground piping.

e. Provide a Foam System Control Panel (FSCP). FSCP shall be a conventional, hard wired type fire alarm panel, UL listed for releasing service to monitor and control the high expansion foam system and all associated fire detection, control supervisory and alarm devices. Provide the functions as specified herein and as shown on the drawings.

1) Provide manual HEF discharge stations, solenoids, pressure switches, waterflow switches horn/strobe units, valve supervisory switches and other fire alarm devices and supervisory devices required herein.

2) Connect the FSCP with the building’s fire alarm control panel (FACP), described elsewhere in these bid documents. The FSCP shall monitor and be monitored by the FACP to achieve the functionality and sequence of operation as shown on the drawings.

f. Test the HEF systems and FSCP and fire detection and alarm systems. Provide all HEF required to complete the testing, including retesting if the test results are not acceptable.

g. Provide operation and maintenance manuals.

h. Provide shop drawings, submittals, and record drawings.

i. Train Base personnel in the operation and maintenance of the systems.

1.2.1 Foam System Control Panel

The control system shall meet the requirements of NFPA 72. The control panel shall be listed in UL Fire Prot Dir or FM P7825a and FM P7825b for "Releasing Device Service". The control panel and the solenoid valve that activates the water control valves shall be compatible with each other. Compatibility shall be per specific UL listing or FM approval of the control equipment.

1.2.1.1 Power Supply

The primary operating power shall be provided from two single-phase 120 VAC circuits. Transfer from normal to backup power and restoration from backup to normal power shall be fully automatic and shall not initiate a false alarm. Loss of primary power shall not prevent actuation of the respective automatic water control valve upon activation of any alarm initiating device. Backup power shall be provided through use of rechargeable, sealed, lead calcium storage batteries.

1.2.1.2 Circuit Requirements

Alarm initiating devices shall be connected to initiating device circuits (IDC), Style D or to signal line circuits (SLC), Style 6, in accordance with NFPA 72. Alarm notification or indicating appliances shall be connected to indicating appliance circuit (IAC), Style W or X in accordance with NFPA 72. A separate circuit shall be provided for actuation of each individual automatic water control valve. The circuits that actuate the water control valves shall be fully supervised so that the occurrence of a single open or a single ground fault condition in the interconnecting conductors shall be indicated at the control panel.

1.3 SYSTEM OPERATIONAL FEATURES

The system shall include manual actuation stations, supervisory and alarm switches, alarm notification appliances, control panel and associated equipment.

1.3.1 System Actuation

Activation of a waterflow alarm from the wet pipe system or a single manual actuation station shall actuate alarm zone circuits of the control panel that, in turn, shall actuate the corresponding automatic water control valve. Actuation of the automatic water control valve shall cause foam concentrate and water solution to discharge from the high expansion foam generators of the deluge system.

1.3.2 Alarm Functions

Activation of any sprinkler waterflow alarm switch or manual actuation station shall cause the illumination of the respective zone annunciator, and activation of the building fire alarm system and transmission of the alarm to the base-wide fire reporting system. Valve tamper alarm shall be monitored by the system control panel and transmitted to the building fire alarm system as a trouble alarm.

1.3.3 Supervisory Functions

The occurrence of a single open or a single ground fault in any alarm initiating device circuit, in the automatic water control valve actuation circuit, in any alarm indicating appliance circuit or in other electrically supervised circuit shall cause the individually labeled control panel trouble light to be illuminated, the audible trouble alarm to be activated, and a trouble alarm to be transmitted to the building fire alarm control panel and to base-wide fire reporting system.

1.4 REGULATORY REQUIREMENTS

Compliance with referenced NFPA standards is mandatory. This includes advisory provisions listed in the appendices of such standards, as though the word "shall" had been substituted for the word "should" wherever it appears. Applicable material and installation standards referenced in Appendix A of NFPA 13 and NFPA 24 shall be considered mandatory the same as if such referenced standards were specifically listed in this specification. In the event of a conflict between specific provisions of this specification and applicable NFPA standards, this specification shall govern. All requirements that exceed the minimum requirements of NFPA 13 shall be incorporated into the design. Reference to "authority having jurisdiction" shall be interpreted to mean the Contracting Officer. If there is a perceived conflict between the referenced codes or standards and this specification, it shall be the Contractor's responsibility to bring the conflict to the attention of the Government in writing for resolution before bids are submitted. System shall be tested, accepted and certified in accordance with NFPA standards and Air Force instructions, with the Base Fire Department being the final approving authority.

1.5 QUALIFICATIONS

a. The Contractor shall be manufacturer approved with at least five years documented experience successfully installing automatic sprinkler systems, HEF suppression systems, fire detection and alarm systems, or the Contractor shall have a contractual agreement with a Subcontractor having such required experience.

b. Shop drawings and calculations shall be prepared by, or under the direct supervision of and certified by the Fire Protection Specialist. The Fire Protection Specialist shall be an individual who is a registered professional engineer regularly engaged in the design and/or construction inspection of fire protection systems or who is certified as a Level III Technician by National Institute for Certification in Engineering Technologies (NICET) in Automatic Sprinkler Systems, Fire Alarm Systems, or Special Hazard Systems. The Fire Protection Specialist shall be regularly engaged in the design and installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

c. Fire Protection System Installer Qualifications: Work specified in this section shall be performed by the Fire Protection System Installer. The Fire Protection System Installer shall be regularly engaged in the installation of the type and complexity of system specified in the Contract documents, and shall have served in a similar capacity for at least three systems that have performed in the manner intended for a period of not less than 6 months.

1.6 QUALITY ASSURANCE

a. The Contractor shall show, to the satisfaction of the Contracting Officer, that the control equipment, control equipment modules, detectors, signaling devices, releasing solenoids, and manual HEF discharge stations are electrically compatible and either are the standard product of a single manufacturer, or are UL listed for use with one another. Any components

determined by the Contracting Officer or by system testing or by operational experience to be either incompatible or non-listed for use with one another shall be replaced with equipment or components which are compatible at no additional cost to the Government.

b. Manufacturer's representatives shall supervise the final testing of equipment. Manufacturer's representatives shall have a minimum of 1 year of experience in testing or installation of the equipment. The Contractor shall provide the services of manufacturer's representatives for the following work:

1) HEF equipment installation, filling and testing.

2) FSCP panel installation, terminations and testing.

c. The Contractor shall warranty all work and equipment for a period of one year. The warranty period shall begin on the date of successful final acceptance testing.

1.7 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; G, AE

Three copies of the HEF and Wet Pipe Sprinkler System Drawings, no later than 21 days prior to the start of sprinkler system installation. The Fire Protection System Drawings shall conform to the requirements established for working plans as prescribed in NFPA 13. Drawings shall also include plan and elevation views demonstrating that the equipment will fit the allotted spaces with clearance for installation and maintenance. Each set of drawings shall contain all information required by NFPA 13 for working plans, shall be signed and sealed by a registered professional engineer, and shall include the following:

a. Descriptive index of drawings in the submittal with drawings listed in sequence by drawing number. A legend identifying device symbols, nomenclature, and conventions used. Utilize symbols indicated in NFPA 170.

b. Floor plans drawn to a scale not less than 1:100 which clearly show locations of foam generators, sprinklers, risers, pipe hangers, seismic separation assemblies, sway bracing, inspector's test connections, drains, and other applicable details necessary to clearly describe the proposed arrangement. Each type of fitting used and the locations of bushings, reducing couplings, and welded joints shall be indicated. Location of all equipment, controls, valves, drains, pipe sleeves in walls and floors, and thrust

restraints shall be included. Fire alarm drawings shall include point-to-point, actual conduit and circuit routing, identifying number, size and type of conduits in the field and identification of the specific conduits/circuits contained therein. All penetrations of fire rated barriers shall be individually noted.

c. Actual center-to-center dimensions between sprinklers on branch lines and between branch lines; from end sprinklers to adjacent walls; from walls to branch lines; from sprinkler feed mains, cross-mains and branch lines to finished floor and roof or ceiling. Maximum distance between sprinklers either on branch lines or between branch lines shall be 3.7 m in the hangar bay. A detail shall show the dimension from the sprinkler and sprinkler deflector to the ceiling in finished areas.

d. Longitudinal and transverse building sections showing typical branch line and cross-main pipe routing as well as elevation of each typical sprinkler above finished floor.

e. Fire suppression and HEF system schematic diagram showing all equipment, valves, water supply, etc.

f. Details of each type of riser assembly; pipe hanger; sway bracing for earthquake protection, and restraint of underground water main at point-of-entry into the building, and electrical devices and interconnecting wiring. Details of installation of HEF risers and generators, sprinkler risers, and the HEF supply and proportioning equipment.

g. Complete point-to-point wiring diagram of the detection and control system. Indicate the detailed interconnection of control panel modules to the devices, the number and size of conductors in each conduit, and size of conduit. Connection points shall be indicated and coordinated with the terminal identification marked on the devices. Complete detailed internal wiring schematic of the control panel and each electrical device shall be provided identifying all required terminations. Detailed description of the functions of the control panel and each module shall be provided.

As-Built Drawings; G, AE

As-built drawings, at least 14 days after completion of the Final Tests. The Sprinkler System Drawings shall be updated to reflect as-built conditions after all related work is completed and shall be on reproducible full-size Mylar film.

SD-03 Product Data

Materials and Equipment; G, AE

Product catalog sheets shall be submitted for all products identified in Part 2, Products, Materials And Equipment of this specification section. Where manufacturer's catalog data sheets or installation manuals/instructions show or describe more than one product or products not relevant to the project, they shall be marked up with arrows or other suitable means and cross-referenced

as necessary to clearly identify both the product(s) to be provided and the specific information applicable to the proposed product. Data shall be adequate to demonstrate compliance with all contract requirements.

Fire Protection Specialist; G, AE

The name and documentation of certification of the proposed Fire Protection Specialists, no later than 14 days after the Notice to Proceed and prior to the submittal of the fire protection system shop drawings and hydraulic calculations.

Sprinkler System Installer Qualifications; G, AE

The name and documentation of certification of the proposed Sprinkler System Installer, concurrent with submittal of the Fire Protection Specialist Qualifications.

Fire Protection Related Submittals; G, AE

A list of the Fire Protection Related Submittals, no later than 7 days after the approval of the Fire Protection Specialist.

Sway Bracing; G, AE

For systems that are required to be protected against damage from earthquakes, load calculations for sizing of sway bracing. Seismic calculations shall be sealed by a registered professional engineer.

Hydraulic Calculations; G, AE

Hydraulic calculations as required by NFPA 13 and ETL 01-2, including a drawing showing hydraulic reference points and pipe segments back to the water supply. Hydraulic calculations shall be sealed by a registered professional engineer.

Fire Alarm Calculations; G, AE

Power supply, standby battery, battery charger calculations for each power supply, configuration of standby batteries in the system, identifying both the non-alarm and alarm load associated with each, demonstrating conformance to the requirements of these specifications for capacity of power supplies, chargers and standby batteries.

Conduit fill calculations.

Spare Parts; G, AE

Spare parts data shall be included for each different item of material and equipment specified. The data shall include a complete list of parts and supplies, with current unit prices and source of supply, and a list of parts recommended by the manufacturer to be replaced after 1 year and 3 years of service. A list of special tools and test equipment required for maintenance

and testing of the products supplied by the Contractor shall be included.

Preliminary Tests; G, AE

Proposed procedures for Preliminary Tests, no later than 14 days prior to the proposed start of the tests.

Proposed date and time to begin Preliminary Tests, submitted with the Preliminary Test Procedures.

Final Acceptance Tests; G, AE

Proposed procedures for Final Acceptance Tests, no later than 14 days prior to the proposed start of the tests.

Proposed date and time to begin Final Acceptance Tests, submitted with the Final Acceptance Test Procedures. Notification shall be provided at least 14 days prior to the proposed start of the test. Notification shall include a copy of the Contractor's Material & Test Certificates.

SD-06 Test Reports

Preliminary Tests; G, AE

Three copies of the completed Preliminary Tests Reports, no later than 7 days after the completion of the Preliminary Tests. The Preliminary Tests Report shall include both the Contractor’s Material and Test Certificate for Underground Piping and the Contractor’s Material and Test Certificate for Aboveground Piping. All items in the Preliminary Tests Report shall be signed by the Fire Protection Specialist.

Fire Protection System Final Tests and Certification; G, AE

Upon completion and testing of the installed system, those copies of the final test reports shall be submitted in booklet form showing all field tests performed to show compliance with the specified performance criteria. Certification by the Fire Protection Specialist shall be provided with signed approval of the Final Acceptance Test Report indicating the fire protection, detection and alarm system is installed and operating in accordance with the contract requirements.

SD-10 Operation and Maintenance Data

Fire Protection System; G, AE

a. Within 60 days of award of contract, the Contractor shall submit 6 copies of a preliminary Operation and Maintenance Manual, prepared specifically for this project and bound in an indexed 3-ring binder, containing:

1. Complete manufacturer's catalog data sheets and installation manuals/instructions for all devices and equipment proposed.

2. A detailed narrative (typed or word processed) description of the system architecture, inputs, and functions.

3. Operator instructions.

4. A detailed description of routine maintenance and testing as required and recommended.

5. Detailed troubleshooting instructions for each specific type of trouble condition recognized by the system.

6. A list of recommended spare parts, including current unit prices.

7. A service directory, including a list of individual's names and telephone numbers.

8. A copy of the fire protection system test reports and pump test reports.

9. Half scale drawings showing the location of all control equipment, control panels, valves, and other operating devices.

b. At least 14 days before field training, submit 6 copies of the O&M manuals, revised to reflect actual equipment and installed connections.

1.8 HYDRAULIC CALCULATIONS

Hydraulic calculations shall be as outlined in NFPA 13 except that calculations shall be performed by computer using software intended specifically for fire protection system design using the design data shown on the drawings. Software that uses k-factors for typical branch lines is not acceptable. Calculations shall be based on the water supply data shown on the drawings. Calculations shall substantiate that the design area used in the calculations is the most demanding hydraulically. Water supply curves and system requirements shall be plotted on semi-logarithmic graph paper so as to present a summary of the complete hydraulic calculation. Fire protection water supply tank shall be considered "empty" at the end of the design fire duration for the demand calculation. Hydraulic calculations shall use this "empty" level to normalize pump test data to "empty" tank conditions. A summary sheet listing sprinklers in the design area and their respective hydraulic reference points, elevations, actual discharge pressures and actual flows shall be provided. Elevations of hydraulic reference points (nodes) shall be indicated. Documentation shall identify each pipe individually and the nodes connected thereto. The diameter, length, flow, velocity, friction loss, number and type fittings, total friction loss in the pipe, equivalent pipe length and Hazen-Williams coefficient shall be indicated for each pipe. For gridded systems, calculations shall show peaking of demand area friction loss to verify that the hydraulically most demanding area is being used. Also for gridded systems, a flow diagram indicating the quantity and direction of flows shall be included. A drawing showing hydraulic reference points (nodes) and pipe designations used in the calculations shall be included and shall be

independent of shop drawings. A margin of safety of 69 kPa or greater safety shall be indicated in the calculations.

1.9 STANDARD PRODUCTS

Material and equipment shall be standard products of their respective manufacturers. Equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

1.10 NAMEPLATES

All equipment shall have manufacturer's name, address, type, and catalog number on a non-corrosive, non-heat sensitive plate securely attached to the equipment.

1.11 VERIFICATION OF DIMENSIONS

The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall revise all pipe, conduit and equipment locations to avoid obstructions and allow installation of new equipment.

1.12 ACCEPTANCE TESTING

Acceptance testing shall be scheduled and performed as indicated in Part 3 of this specification.

1.13 RECORD DRAWINGS

a. The Contractor shall maintain on site a separate set of updated, approved shop drawings for the overall system, marked in red, to indicate all deviations from the shop drawings to indicate as-built conditions.

b. Upon approval of the record drawing submittal, before either final payment or acceptance of the project by the Government, provide plasticized half-scale copies of all detailed wiring diagrams required for the shop drawing submittal, updated to reflect as-built conditions.

1.14 EMERGENCY SERVICE

The Contractor shall provide emergency repair service for the systems at no cost to the Government, within 48 hours of a request for such service by the Government during both the installation and the warranty periods. This service shall be provided on a 24 hours per day, seven days per week basis.

1.15 COORDINATION OF TRADES

Piping offsets, fittings, and any other accessories required shall be furnished as required to provide a complete installation and to eliminate interference with other construction. Sprinklers shall be installed over and under ducts, piping and platforms when such equipment can negatively effect or disrupt the sprinkler discharge pattern and coverage.

1.16 DELIVERY AND STORAGE

All equipment delivered and placed in storage shall be housed in a manner to preclude any damage from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Additionally, all pipes shall either be capped or plugged until installed.

PART 2 PRODUCTS

2.1 GENERAL

Materials and equipment shall have been tested by Underwriters Laboratories, Inc. and listed in UL Fire Prot Dir or approved by Factory Mutual and listed in FM P7825a and FM P7825b. Where the terms "listed" or "approved" appear in this specification, such shall mean listed in UL Fire Prot Dir or FM P7825a and FM P7825b.

2.2 UNDERGROUND PIPING SYSTEMS

2.2.1 Pipe

Piping from a point 150 mm above the floor to a point 1500 mm outside the building wall shall be ductile iron with a rated working pressure of 1207 kPa conforming to AWWA C151, with cement mortar lining conforming to AWWA C104. Piping more than 1500 mm outside the building walls shall comply with Section 02510A WATER DISTRIBUTION SYSTEM.

2.2.2 Fittings and Gaskets

Fittings shall be ductile iron conforming to AWWA C110. Gaskets shall be suitable in design and size for the pipe with which such gaskets are to be used. Gaskets for ductile iron pipe joints shall conform to AWWA C111.

2.3 ABOVE GROUND PIPING AND FITTINGS

a. Piping which contains water or HEF solution shall be Schedule 40 black steel meeting either ASTM A 53 or ASTM A 795 requirements with threaded, flanged, grooved or shop-welded fittings. Fittings shall be cast iron or malleable iron. Fittings and flanges shall be rated at not less than 1.2 MPa.

1) Schedule 10, Schedule 40 "replacement," and other piping systems which are not standard weight, Schedule 40 black steel piping, will not be accepted.

2) Pipe sizes 200 mm and larger may be Schedule 30 in lieu of Schedule 40.

3) Cut groove, mechanical couplings, shall be rated at a minimum of 1.7 MPa. All mechanical couplings provided shall be the product of a single manufacturer. All fasteners, parts and materials used shall be the product of the coupling manufacturer, specifically intended by the manufacturer for installation with the coupling.

4) Trim piping provided with deluge valves, pressure-reducing valves, and pressure relief valves shall be the standard components provided by the valve manufacturers.

5) Fitting for reductions in pipe size shall have tapered reducing waterways. Reducing fittings that have abrupt changes in waterway size are not acceptable.

b. Piping that contains HEF concentrate shall be either Schedule 40, 300 series stainless steel pipe, conforming to ASTM A 795 or ASTM A 53, with only flanged or shop-welded fittings, or filament-wound fiberglass conforming to ASTM D 2996, designation code RTRP-11 FF-3121, and installed in accordance with ASME B31.3. Fittings and flanges shall be rated at not less than 1.2 MPa.

c. System piping shall be sized to limit flow velocity to 6 meters per second or less above grade.

2.4 PIPE HANGERS/SUPPORT/SWAY BRACING

a. Hangers, riser support, and system sway bracing shall be in accordance with NFPA 13.

b. Hangers and accessories shall be galvanized steel.

2.5 VALVES

a. Valves in Contact with Water or HEF Solution

1) All valves shall be UL listed or FM approved for their intended use.

2) Valves shall be of cast iron construction and shall be rated for a working pressure of not less than 1.2 MPa.

3) OS&Y valves shall be UL listed. Butterfly valves shall not be accepted as a substitution where OS&Y valves are indicated.

4) Valves indicated as supervised shall be provided with a UL listed valve supervisory switch, connected to the fire alarm system.

5) Hose valves shall be all brass or bronze, gate valve type straightway pattern.

b. Valves in Contact with HEF Concentrate

1) Valves shall be of stainless steel, brass or bronze construction, and shall be rated for a working pressure of not less than 1.2 MPa.

2) Seat and seal material for valves in contact with HEF concentrate shall be compatible with HEF concentrate.

3) Valves indicated as supervised shall be provided with a UL listed valve supervisory switch, connected to the fire alarm system.

c. The pressure ratings of all valves shall meet or exceed maximum working pressure available within the system.

2.6 STRAINERS

a. Basket Strainer

1) Basket strainer shall have cast iron flanged body and cover flange rated for 1.2 MPa.

2) Strainer basket shall be formed of perforated stainless steel sheet. Basket shall have a minimum 50% open area.

3) Pressure drop due to friction of flow through the basket strainer shall not exceed 28 kPa at a flow rate of 7570 L/minute when the strainer is 50% clogged.

b. Strainers in Contact with HEF Concentrate

1) Strainers shall have stainless steel, brass or bronze construction bodies, and shall be rated for a working pressure of not less than 1.2 MPa.

2) Strainer basket shall be formed of perforated stainless steel sheet.

2.7 DELUGE VALVES

a. Deluge valves shall be provided with standard trim as required for a complete and operable 24 volt DC electric solenoid actuated preaction sprinkler system, suitable for manual and automatic operation.

b. Deluge valves shall be of the non-latching type. The valve shall be externally resettable by operation of the valve trim, without removing the valve's face plate.

c. Deluge valves shall be right angle pattern type with a maximum size of 150 mm.

d. Provide valve with pressure switches for alarm.

e. Deluge valve bodies shall be provided with a factory applied corrosion resistant coating.

f. UL listed speed control assemblies shall be provided with the deluge valve trim, to regulate the valve opening and closing speed. These assemblies shall include a pair of needle valves, pilot drilled by the manufacturer to prevent full shut off.

2.8 ALARM CHECK VALVES

Alarm check valve shall be provided with standard trim including pressure gauges, alarm line vent, testing bypass, etc. for a complete installation. A pressure relief device shall also be provided above the alarm check valve as part of the trim package. Retarding chambers and alarm pressure switches are not required.

2.9 PRESSURE GAGES FOR WATER OR HEF SOLUTION

a. The pressure gages shall be installed at each alarm check valve and at each deluge valve as part of the standard valve trim.

b. The gages shall have a range of 0 – 2.1 MPa.

c. The dial size shall be 8.9 mm in diameter, minimum. The dial shall be white with black graduations and numerals.

d. Gages shall be provided with shock isolators.

2.10 AUTOMATIC SPRINKLERS

2.10.1 Automatic Sprinklers

Automatic sprinklers for the wet pipe water sprinkler systems shall be:

a. Quick response type, rated for 79.4 C in the Hangar Bay, and ordinary temperature classification in the Shops and Office areas.

b. Standard 13 mm orifice, with a K-factor between 5.5 and 5.6, bronze upright or pendent type, for use in Hangar Bay.

2.10.4 Recessed Sprinkler

Recessed sprinkler shall be chrome-plated, stainless steel or white polyester, quick-response type and shall have a nominal 12.7 mm or 13.5 mm orifice.

2.10.5 Flush Sprinkler

Flush sprinkler shall be chrome-plated, stainless steel or white polyester, quick-response type and shall have a nominal 12.7 mm or 13.5 mm orifice.

2.10.6 Pendent Sprinkler

Pendent sprinkler shall be of the fusible strut or glass bulb type, recessed quick-response type with nominal 12.7 mm or 13.5 mm orifice. Pendent sprinklers shall have a polished chrome, stainless steel or white polyester finish. Provide one piece matching metallic escutcheon with less than 20 mm depth.

2.10.7 Upright Sprinkler

Upright sprinkler shall be brass, quick-response type and shall have a nominal 12.7 mm or 13.5 mm orifice.

2.10.8 Sidewall Sprinkler

Sidewall sprinkler shall have a nominal 12.7 mm orifice. Sidewall sprinkler shall have a brass, polished chrome, stainless steel or white polyester finish. Sidewall sprinkler shall be the quick-response type.

2.11 FIRE DEPARTMENT CONNECTION

Fire department connection shall be projecting or flush type with cast brass body, matching wall escutcheon lettered "Auto Spkr" with a polished brass finish. The connection shall have two inlets with individual self-closing clappers, caps with drip drains and chains. Female inlets shall have 65 mm diameter American National Fire Hose Connection Screw Threads (NH) per NFPA 1963.

2.12 DISINFECTING MATERIALS

2.12.1 Liquid Chlorine

Liquid chlorine shall conform to AWWA B301.

2.12.2 Hypochlorites

Calcium hypochlorite and sodium hypochlorite shall conform to AWWA B300.

2.13 ACCESSORIES

2.13.1 Identification Sign

Valve identification sign shall be minimum 150 mm wide by 50 mm high with enamel baked finish on minimum 1.214 mm steel or 0.6 mm aluminum with red letters on a white background or white letters on red background. Wording of sign shall include, but not be limited to "main drain," "auxiliary drain," "inspector's test," "alarm test," "alarm line," and similar wording as required to identify operational components.

2.14 HEF CONCENTRATE

a. High expansion foam concentrate shall be an UL listed high expansion foam concentrate for 2.75% proportioning.

b. High expansion foam concentrate shall be the product of the manufacturer of the HEF equipment.

2.15 HEF DIAPHRAGM TANK BALANCED PRESSURE PROPORTIONING SYSTEM

HEF concentrate proportioning means shall be a balanced pressure proportioning system utilizing a pressure proportioning diaphragm tank meeting the requirements of NFPA 11A and shall consist of the following:

a. HEF diaphragm storage tank shall be a steel pressure vessel with a full diaphragm (bladder) within the vessel. The tank shall be rated for 1.2 MPa working pressure and shall be constructed in accordance with the ASME BPVC VIII D1. ASME labels shall be permanently attached to the tank.

b. The diaphragm shall be nylon reinforced Buna-N rubber conforming to the inside shape of the tank. HEF concentrate shall be stored inside the diaphragm, and the concentrate shall not be in contact with the steel tank. The tank shall have perforated PVC tubes installed inside to assure full displacement of the stored concentrate.

c. The tank shall be equipped with all the manufacturer’s standard fittings and trim including HEF fill and drain connections, water fill and drain connections, water and HEF pressure relief valves, water and HEF pressure gauges, HEF sight gauge and strainer on the tank's water inlet.

d. The tank shall be horizontal type, mounted on steel saddles suitable for direct mounting on a concrete floor. The Contractor shall fill the tank with HEF 2.75% concentrate to its full capacity prior to system testing and shall refill the tank to full capacity upon the successful completion of all required testing. The Contractor shall provide filling and draining instructions mounted under plexiglass in a location directed by the Contracting Officer.

e. The filling of the diaphragm with HEF concentrate shall be performed by and/or directly supervised by a qualified representative of the manufacturer or supplier of the diaphragm tank. A qualified representative shall have at least one year of experience in service or installation of HEF diaphragm tanks.

f. The HEF proportioner shall be the product of the manufacturer of the HEF diaphragm storage tank. It shall be flanged at both ends, or of the between the flanges type. The HEF proportioner's size shall be suitable to proportion HEF concentrate to a 2.75% solution over a water flow range expected for this project. Unit shall be UL listed, and/or FM approved.

2.16 HEF FOAM GENERATORS

a. The high expansion foam generators shall be water powered.

b. The screens shall be of stainless steel construction.

c. The high expansion foam generators shall be UL listed and/or FM approved.

d. The quantity of high expansion foam generators shall be determined for the generators used, and shall provide the coverage required by the design criteria.

2.17 AUTOMATED HEF CONCENTRATE VALVES

a. Automated HEF concentrate valves shall be either hydraulically controlled ball valves, or HEF deluge valves, as specified herein. All automated HEF concentrate valves provided shall be of the same type.

b. Hydraulically Controlled Ball Valves

1) Hydraulically controlled ball valve shall be a full port, ¼ turn ball valve, of the same nominal size as the connecting HEF concentrate piping.

2) The valve body shall be bronze or stainless steel. The valve ball shall be stainless steel.

3) The valve shall be provided with a hydraulic actuator, designed for on/off operation of ¼ turn ball valves. The actuator

cylinder shall be designed for operation by water pressure, and shall be rated for not less than 862 kPa of water pressure.

4) The valve shall be in the closed position until the HEF system is operated. Water pressure to the actuator shall be provided from the alarm line of the deluge valve, as indicated on the drawings.

5) A means of disengaging the cylinder, or releasing its water pressure, for manually overriding the valve shall be provided.

6) The valve shall have an external mechanical position indicator.

c. HEF Deluge Valves

1) HEF deluge valve shall be a deluge valve specifically designed for use in controlling HEF concentrate, and shall have passageways protected with a corrosion resistant coating applied by the manufacturer.

2) The valve shall be of the non-latching type.

3) The valve shall be held closed by water pressure on the top chamber.

4) Valve shall be right angle pattern type.

5) The trim piping of the HEF deluge valves shall be connected to the trim piping of deluge valve on its associated HEF solution riser. This shall be done strictly per the deluge valve manufacturers instructions, and in such a manner that both the HEF deluge valve and its associated HEF solution deluge valve shall be opened by the same 24 volt DC electric solenoid, supplied as part of the deluge valves standard trim.

6) HEF deluge valve shall be of the next nominal size larger than the connected HEF concentrate piping.

2.18 TEST HEADER

a. Provide a test header for the HEF system. Test header shall be located inside the aircraft servicing area as near as practical to an outside door and shall contain a tap with ball valve and hose connection or other means for obtaining a sample of the foam/water solution. All valves shall be accessible from the floor.

b. Test header shall be configured to allow each proportioner to be individually tested.

c. Each test header shall have at least four valved 64 mm hose fittings.

2.19 SURGE (EXPANSION) TANKS

a. Surge (expansion) tanks shall be diaphragm type hydropneumatic expansion tanks, conforming to ASME BPVC VIII D1. Tanks shall be ASME

approved, stamped and labeled for a maximum working pressure of 1.7 MPa or greater.

b. Tanks shall be of steel construction, and factory painted on the exterior.

c. Tanks shall be vertical type, with an end (bottom) flanged fluid port, suitable for mounting on top of a tee fitting in system piping.

d. Each tank shall be equipped with an air pressure charging valve, a pressure gage, a drain valve and a system connection.

e. Tanks shall be of the size and capacity as shown on the drawings. Provide a surge tank for each wet pipe zone, and one for the incoming water supply sized for all systems operating simultaneously.

2.20 FOAM SYSTEM CONTROL PANEL (FSCP)

a. The FSCP and FACP shall be connected to operate as a complete system. The system shall provide the operating and supervisory functions as specified, and as shown on the drawings. The devices each panel shall monitor are shown on the drawings.

1) The FSCP, which contains releasing circuits for solenoids, shall be hard wired, diode matrix/relay logic type fire alarm panel, UL listed for releasing service, with modular, plug in relays. Addressable type releasing panels are prohibited.

2) The FSCP shall be monitored by the building FACP or shall provide outputs to the radio fire alarm transceiver.

b. The FSCP shall be compatible with the new FACP.

c. All fire alarm system control equipment shall be of modular construction to facilitate system expansion and servicing.

d. All circuits shall be installed as non-power limited fire protective signaling circuits as defined by the National Electrical Code.

e. Loss of power, including any or all batteries, shall not require the reloading of program from any source. The loss of primary power or the sequence of applying primary or emergency power shall not affect the transmission of alarm, supervisory or trouble signals.

f. Automatic transmission of fire alarm, HEF discharge alarm, common supervisory, and common trouble signals. These contacts will be connected to the radio fire alarm transceiver.

1) Provide zoned output contacts for common alarm, HEF discharge alarm, common supervisory, and common trouble signals. These contacts will be connected to the radio fire alarm transceiver.

2) Provide zoned output contacts in FACP to activate fire pump engines in Building 1837. These contacts shall be hardwired.

g. A power transfer circuit that will switch to stand-by power automatically and instantaneously upon loss of normal AC power.

h. The FSCP shall contain a disconnect switch for each individual releasing zone. Deactivating any releasing zone shall cause a trouble condition.

2.21 POWER SUPPLIES

a. All fire alarm system AC power connections shall be hardwired via dedicated circuits serving no other load(s). Each AC power circuit shall be provided with a single, approved disconnecting means between the service entrance and the fire alarm system, and shall, along with all associated connections, be installed entirely within approved electrical enclosures or conduits. The power circuit disconnecting means shall be clearly labeled “Foam System Control Panel Power” and shall be locked.

b. Design load connected to any power supply, to any single circuit, and to any standby battery shall not exceed two thirds of its rated (continuous) capacity.

1) Power supply size shall be calculated by determining required capacity (maximum required amperes) and multiplying by 1.5.

2) The loads applied to individual circuits shall be calculated by determining the actual maximum loading (the sum of maximum amperes required by the connected devices) and multiplying by 1.5.

3) Battery size shall be calculated by determining required amp-hour capacity (load x time) and multiplying by 1.5.

c. All portions of the fire alarm systems shall be designed and equipped to be capable of operating on standby (rechargeable) battery power.

d. Upon failure of normal (AC) power, the affected portions(s) of the system(s) shall automatically switch over to battery power without disruption of normal system annunciation or operation.

e. Standby battery capacity shall be sufficient to maintain the entire system in a non-alarm condition for 48 hours, followed by 15 minutes in full load alarm condition with all zones in alarm and all evacuation signaling, releasing and remote signaling functions operating.

f. Power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 8 hours maximum. Standby battery capacity may be increased to meet this requirement, but shall not reduce the 60% capacity requirements as specified.

g. All power supplies shall continuously monitor battery voltage and charging status, causing a trouble signal in response to a low battery or charger failure condition.

2.22 LINE VOLTAGE SURGE ARRESTORS

a. Provide line voltage surge arrestors as shown to suppress voltage transients which might damage foam system control panel, fire alarm panel and transceiver components. Units shall wire in series to the power supply of the protected equipment with screw terminations.

b. Units shall be UL 1449 listed with a 330 volt suppression level and have a maximum response time of 5 nanoseconds. Units shall also meet IEEE C62.41 category B tests for surge capacity.

c. Units shall feature multi-stage construction which includes inductors and silicon avalanche zener diodes.

d. Units shall have a long life indicator lamp (LED or neon lamp) which extinguishes upon failure of protection components.

e. If units are fused, fuses shall be externally accessible when this feature is available.

f. One such acceptable product is model HSP-121BT2 as manufactured by Edco (Ocala, Florida). Provide detailed manufacturers data sheets demonstrating compliance with all specified requirements.

2.23 FOAM SYSTEM NOTIFICATION SIGNALS

Notification appliances shall be suitable for connection to supervised alarm indicating circuits. Appliance shall have a separate screw terminal for each conductor. The surface of the appliance shall be red in color.

a. Provide red visual alarm signals (strobe or rotating beacon) within the aircraft servicing area to indicate foam system activation.

b. The visual alarm signals shall comply with any base-adopted standard for audio-visual signal for foam system activation.

c. The foam system notification signals shall be connected to the foam system control panel (FSCP), if provided, or the facility fire alarm control panel (FACP).

d. All devices shall be suitable for Class I, Division 2 locations.

2.23.1 Alarm Bell

Bell shall be 250 mm diameter, surface-mounted vibrating type with matching back box. Sound output shall be a minimum of 85 dBA at 3000 mm. Bell shall operate on nominal 24 VDC. Bells shall have screw terminals for in-out wiring connection. Bells used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grilles.

2.23.2 Alarm Horn

Horn shall be surface mounted, with the matching mounting back box surface mounted vibrating type suitable for use in an electrically supervised circuit. Horns shall operate on nominal 24 VDC and have screw terminals for in-out wiring connection. Sound output shall be a minimum of 85 dBA at 3000

mm. Horns used in exterior locations shall be specifically listed or approved for outdoor use and be provided with metal housing and protective grills.

2.24 MANUAL HEF DISCHARGE STATIONS

a. Manual HEF discharge stations shall be installed at exits and at locations shown on the drawings.

b. Manual HEF discharge stations shall be UL listed manual fire alarm stations of the double action type. Stations shall not be of the break glass type.

c. Manual HEF discharge stations shall be yellow in color, distinctively different from building manual fire alarm stations.

d. Manual HEF discharge stations shall be mounted with a clear plastic tamper cover that must be lifted prior to actuating the station. Any colored portions of the cover shall be yellow. Any lettering must state “HEF” or “FOAM”. The word(s) ‘fire’ or ‘fire alarm’ shall not appear on the cover.

e. Manual HEF discharge stations shall require a key for reset. The key shall match the key for the fire alarm panel and HEF releasing panel.

f. Manual HEF discharge stations shall be surface or semi-flush mounted, using weatherproof backboxes and appropriate mounting hardware, on walls or columns, 1220 – 1370 mm from the floor to the top of the station.

g. Provide phenolic plastic signs that states “Start FOAM System” in red lettering not less than 76 mm high on a yellow/ lime yellow background.

h. Manual discharge stations shall be suitable for Class I, Division 2 locations.

2.25 WATERFLOW SWITCHES

a. Waterflow switches shall be installed on all system risers.

b. Waterflow switches shall be installed in accordance with manufacturer’s installation instructions and shall be UL listed or FM approved. Two sets of SPDT (Form C) contacts shall be provided.

c. Waterflow switches shall be connected to the existing facility FACP. All wiring shall be approved for fire alarm use and installed in conduit.

2.25.1 Waterflow Alarm Bell

Electrically operated, exterior-mounted, waterflow alarm bell shall be provided and installed in accordance with NFPA 13. Waterflow alarm bell shall be rated 24 VDC and shall be connected to the Fire Alarm Control Panel (FACP) in accordance with Section 13851A FIRE DETECTION AND ALARM SYSTEM, ADDRESSABLE. Mechanically operated, exterior mounted, water motor alarm assembly shall be provided in accordance with NFPA 13. Water motor alarm

assembly shall include a body housing, impeller or pelton wheel, drive shaft, striker assembly, gong, wall plate and related components necessary for complete operation. Minimum 20 mm galvanized piping from the body housing shall be provided between the housing and the alarm check valve. Drain piping from the body housing shall be minimum 25 mm galvanized and shall be arranged to drain to the outside of the building. Piping shall be galvanized both on the inside and outside surfaces.

2.26 VALVE SUPERVISORY (TAMPER) SWITCHES

a. Valve supervisory switches shall be installed on all valves controlling the water supply, the HEF concentrate supply, the HEF solution and the wet pipe system.

b. Valve supervisory switches shall be appropriate for the type of valve on which they are installed, shall be installed in accordance with the manufacturer's installation instructions, and shall have metal housings. Switches shall be UL listed or FM approved. Two sets of SPDT (Form C) contacts shall be provided.

c. Valve supervisory switches shall be connected to the building fire alarm system control panel. All wiring shall be approved for fire alarm use and installed in conduit.

2.27 TEMPERATURE MONITORING SYSTEM (PROVIDE IN OPTION NO. 1)

a. Provide a temperature monitoring system for the aircraft servicing area in all geographic areas having a 99.6% dry bulb temperature less than –1 degree C.

b. The temperature sensors should be located at the same level as the sprinkler piping and spaced not more than 60 m apart and shall have a minimum of 8 temperature sensors as indicated on drawings.

c. The temperature monitoring system should be connected to the FACP as a dedicated supervisory zone.

d. The temperature monitoring system shall consist of a digital monitoring panel and individual point temperature sensors. Monitoring panel shall be expandable. Monitoring panel shall have a front panel LED display and shall be capable of remote manual temperature sensor reset at the monitoring panel. LED display shall indicate individual point temperatures and sensor identity. The monitoring panel shall be capable of a minimum of 8 analog inputs and 1 digital output. Digital monitoring panel shall be provided with 120 to 24 volt control power transformer and wall mounting base.

2.28 WIRING

a. All low voltage wiring shall be solid copper, 14 gage AWG, minimum.

b. Low voltage wiring between Buildings 1837 and 1823 shall be solid 10 AWG, minimum.

c. All AC power wiring shall be solid copper, bunch tinned (bonded) stranded copper or stranded copper, 12 gage AWG, minimum.

d. All wiring shall be insulated for 600 volts (except bare shield drain conductors); insulation type per NEC Article 760 for non-power limited circuits.

e. The use of aluminum wire is prohibited.

2.29 CONDUIT

a. Conduit shall be UL listed, rigid galvanized steel, minimum 19 mm size.

b. Flexible conduit used for whips to devices shall be UL listed, minimum 19 mm size, liquid-tight, flexible metallic conduit, 1.9 m maximum length.

2.30 SPECIAL TOOLS AND SPARE PARTS

Special tools necessary for the maintenance of the equipment shall be furnished. Two spare sets of fuses of each type and size required shall be furnished.

PART 3 EXECUTION

3.1 ABOVEGROUND PIPING INSTALLATION

3.1.1 Protection of Piping Against Earthquake Damage

The system piping shall be protected against damage from earthquakes. Seismic protection shall include flexible and rigid couplings, sway bracing, and other features as required by NFPA 13 for protection of piping against damage from earthquakes.

3.1.2 Piping in Exposed Areas

Exposed piping shall be installed so as not diminish exit access widths, corridors, or equipment access. Exposed horizontal piping, including drain piping, shall be installed to provide maximum headroom.

3.1.3 Piping in Finished Areas

In areas with suspended or dropped ceilings and in areas with concealed spaces above the ceiling, piping shall be concealed above ceilings. Piping shall be inspected, tested and approved before being concealed. Risers and similar vertical runs of piping in finished areas shall be concealed.

3.1.4 Pendent Sprinklers Locations

Sprinklers installed in the pendent position shall be of the listed dry pendent type, unless otherwise indicated. Dry pendent sprinklers shall be of the required length to permit the sprinkler to be threaded directly into a branch line tee. Hangers shall be provided on arm-overs exceeding 300 mm in length. Dry pendent sprinkler assemblies shall be such that sprinkler ceiling plates or escutcheons are of the uniform depth throughout the

finished space. Pendent sprinklers in suspended ceilings shall be a minimum of 150 mm from ceiling grid. Recessed pendent sprinklers shall be installed such that the distance from the sprinkler deflector to the underside of the ceiling shall not exceed the manufacturer's listed range and shall be of uniform depth throughout the finished area.

3.1.5 Upright Sprinklers

Riser nipples or "sprigs" to upright sprinklers shall contain no fittings between the branch line tee and the reducing coupling at the sprinkler. Riser nipples exceeding 750 mm in length shall be individually supported.

3.1.6 Pipe Joints

Pipe joints shall conform to NFPA 13, except as modified herein. Not more than four threads shall show after joint is made up. Welded joints will be permitted, only if welding operations are performed as required by NFPA 13 at the Contractor's fabrication shop, not at the project construction site. No welding or flame cutting will be permitted in the building. Flanged joints shall be provided where indicated or required by NFPA 13. Grooved pipe and fittings shall be prepared in accordance with the manufacturer's latest published specification according to pipe material, wall thickness and size. Grooved couplings and fittings shall be from the same manufacturer. Grooved joints shall not be used in concealed locations, such as behind solid walls or ceilings, unless an access panel is shown on the drawings for servicing or adjusting the joint. Threaded joints shall be sealed with Teflon tape. The use of "pipe dope" will not be permitted.

3.1.7 Reducers

Reductions in pipe sizes shall be made with one-piece tapered reducing fittings. The use of bushings or fittings with abrupt changes in waterway size or grooved-end or rubber-gasketed reducing couplings will not be permitted.

3.1.8 Pipe Penetrations

Cutting structural members for passage of pipes or for pipe-hanger fastenings will not be permitted. Pipes that must penetrate concrete or masonry walls or concrete floors shall be core-drilled and provided with pipe sleeves. Each sleeve shall be Schedule 40 galvanized steel, ductile iron or cast iron pipe and shall extend through its respective wall or floor and be cut flush with each wall surface. Sleeves shall provide required clearance between the pipe and the sleeve per NFPA 13. The space between the sleeve and the pipe shall be firmly packed with mineral wool insulation. Where pipes penetrate fire walls, fire partitions, or floors, pipes shall be fire stopped in accordance with Section 07840A FIRESTOPPING and surfaces shall be patched and touch-up painted to a finished appearance. In penetrations that are not fire-rated or not a floor penetration, the space between the sleeve and the pipe shall be sealed at both ends with plastic waterproof cement that will dry to a firm but pliable mass or with a mechanically adjustable segmented elastomer seal. Penetrations through below-grade walls shall be made with Link-Seal type seals.

3.1.9 Escutcheons

Escutcheons shall be provided for all exposed pipe penetrations of ceilings and walls. Escutcheons shall be securely fastened to the pipe at surfaces through which piping passes.

3.1.10 Inspector's Test Connection, Sprinkler Systems

Inspectors test connections shall be provided to test each flow switch and alarm device. Unless otherwise indicated, test connection shall consist of 25 mm pipe connected to the remote branch line or as a combination test and drain valve; a test valve located approximately 2 m above the floor at an easily accessible location; a smooth bore brass outlet equivalent to the smallest orifice sprinkler used in the system; and a painted metal identification sign affixed to the valve with the words "Inspector's Test." The discharge orifice shall be located outside the building wall or to a floor drain or sink 100 mm or larger, directed so as not to cause damage to adjacent construction or landscaping during full flow discharge. Inspector's Test connections shall be provided to test each flow switch and alarm device.

3.1.11 Installation of Fire Department Connection

Connection shall be mounted on the exterior wall approximately 900 mm above finished grade. The piping between the connection and the check valve shall be provided with an automatic drip in accordance with NFPA 13 and arranged to drain to the exterior or an approved floor drain.

3.1.12 Gauges

All gauges shall be visible from the floor.

3.1.13 Valves

All valves shall be located for ease of access from the lowest level possible. Chain operators shall be provided for valves located more than 2 m AFF. Platforms with access ladders shall be provided for valves located more than 3.5 m AFF.

3.2 PIPE HANGERS

a. Hangers and supports shall be adequate to maintain the supported load in proper position under all operating conditions.

b. Hanger rod sizes shall be in accordance with NFPA 13.

c. Hangers and supports shall be spaced not more than 3.6 m apart and shall be located at or near changes in direction of pipelines. Hangers shall not be located more than 2 m from any tee or elbow.

d. Where pipe hangers are fastened to building purlins, they shall be fastened to the side (web) of the purlin, and not from the top or bottom flanges of the purlin.

e. No piping shall be supported from other piping, from metal stairs, ladders, walkways, metal decks, bridging, bracing or suspended ceilings.

f. Cutting of structural members shall be prohibited.

3.3 SWAY BRACING

Sway bracing shall be provided where piping changes direction in accordance with NFPA 13, Appendix A, paragraph A-4-6.4.3.5.2 and related paragraphs.

3.4 SYSTEM DRAINS

a. All system piping shall be provided with drains in accordance with NFPA 13. The drain valves shall not be installed higher than 2.1 m above the finished floor.

b. Drain valves shall be provided with permanent identifying tags to indicate their associated sprinkler zone.

3.5 IDENTIFICATION

a. Identify all interior exposed piping, at 8 m intervals with plastic wraparound-type pipe labels conforming to ANSI A13.1, indicating the type of fluid carried and direction of flow. Labels are not required on sprinkler system branch lines and pipes less than 50 mm nominal diameter. Labels shall include "Fire Protection Water", "Foam Concentrate", "Fire Sprinkler", and "High Expansion Foam Solution" piping.

b. Provide brass number tags on each control valve with number stamped in black, secured to valve wheel with key chain.

c. A list of zones, noting which devices are connected to each zone, shall be provided on inner surface of the doors of each fire alarm panel.

d. Signs shall be affixed to each control valve, inspector test valve, main drain, auxiliary drain, test valve, and similar valves as appropriate and as required by NFPA 13. Hydraulic design data nameplates shall be permanently affixed to each sprinkler riser as specified in NFPA 13.

3.6 UNDERGROUND PIPING INSTALLATION

Restraint of the underground piping must be detailed on the shop drawings. The fire protection water main shall be laid, and joints anchored, in accordance with NFPA 24. Minimum depth of cover shall be 1321 mm. The supply line shall terminate with a flanged piece. A blind flange shall be installed temporarily on top of the flanged piece to prevent the entrance of foreign matter into the supply line. A concrete thrust block shall be provided at the elbow where the pipe turns up. In addition, joints shall be anchored in accordance with NFPA 24 using pipe clamps and steel rods from the elbow to the flange above the floor and from the elbow to a pipe clamp in the horizontal run of pipe. Pipe entrance into building shall be through the wall. Buried steel components shall be provided with a corrosion protective coating in accordance with AWWA C203. Piping more than 1500 mm outside the building walls shall meet the requirements of Section 02510A WATER DISTRIBUTION SYSTEM.

3.7 EARTHWORK

Earthwork shall be performed in accordance with applicable provisions of Section 02316A EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

3.8 ELECTRICAL WORK

Unless otherwise specified herein, power supply equipment and wiring shall be in accordance with Section 16415A ELECTRICAL WORK, INTERIOR.

3.8.1 Overcurrent and Surge Protection

All equipment connected to alternating current circuits shall be protected from surges per IEEE C62.41 and NFPA 70. Cables and conductors that serve as communications links, except fiber optics, shall have surge protection circuits installed at each end. Fuses shall not be used for surge protection.

3.8.2 Grounding

Grounding shall be provided to building ground.

3.8.3 Wiring

System field wiring shall be installed in 20 mm minimum diameter electrical metallic tubing or metallic conduit. Wiring for the sprinkler system fire detection and control system shall be installed in tubing or conduits dedicated for that use only and not installed in conduit, outlet boxes or junction boxes which contain lighting and power wiring or equipment. Circuit conductors entering or leaving any mounting box, outlet box enclosure or cabinet shall be connected to screw terminals with each terminal marked and labeled in accordance with the wiring diagram. No more than one conductor shall be installed under any screw terminal. Connections and splices shall be made using screw terminal blocks. The use of wire nut type connectors is not permitted. Wiring within any control equipment shall be readily accessible without removing any component parts. Conductors shall be color-coded and shall be identified within each enclosure where a connection or termination is made. Conductor identification shall be by plastic-coated, self-sticking, printed markers or by heat-shrink type sleeves. Circuits shall be wired to maintain electrical supervision so that removal of any single wire from any device shall cause a "trouble" condition on the control panel.

3.8.4 Control Panel

The control panel and its assorted components shall be mounted so that no part of the enclosing cabinet is less than 600 mm or more than 2000 mm above the finished floor.

3.8.5 Manual Actuation Stations

Manual actuation stations shall be mounted readily accessible and 1220-1370 mm above the finished floor to top of station.

3.8.6 Notification Appliances

Notification appliances shall be mounted a minimum of 2400 mm above the finished floor unless limited by ceiling height.

3.9 FSCP FIRE ALARM AND CONTROL SYSTEM SUPERVISION

a. All wiring required for proper system operation, except as specifically allowed herein, shall be electrically supervised for opens and shorts to ground. Wiring faults on supervised circuits shall initiate trouble conditions.

b. All circuits shall be installed as non-power limited fire protective signaling circuits as defined by the National Electrical Code.

c. Design load (in alarm condition) connected to any circuit shall not exceed two thirds of the circuit's rated (continuous) capacity.

d. Circuits for manual HEF discharge shall be Class A, Style D as defined by NFPA 72.

e. Circuits for evacuation signaling appliances shall be Class A, Style Z as defined by NFPA 72.

f. Any single open or single ground condition on any initiating device circuit or releasing circuit shall cause a trouble signal.

g. All AC power connections and all standby battery connections shall be electrically supervised. Disconnection of any fire alarm system (primary or backup) power supply shall cause a trouble signal.

h. All connections between the fire alarm system(s) and any remote signaling apparatus provided for off-premises transmission of signals shall be electrically supervised such that any wiring fault in the connecting circuit which would prevent transmission of signals shall cause a trouble signal.

i. All control components shall be placement supervised such that removal of any control panel module shall cause a trouble signal.

j. All power supplies/battery chargers shall be supervised for loss of normal AC operating power. Loss of AC power to any power supply/battery charger shall cause a trouble signal.

k. All standby batteries shall be continuously monitored by the system. Low-battery or missing battery conditions shall cause a trouble signal.

l. The availability of operating power to the fire alarm system, including all required components thereof, shall be supervised to the point of connection to the dependent equipment. Loss of operating power to any required system components shall cause a trouble signal.

m. All initiating devices and releasing devices shall be supervised such that removal of any such device shall cause a trouble signal.

3.10 FIRE PROTECTION CONDUIT SYSTEMS

a. The requirements of this section apply to all fire protection system conduits, electrical enclosures, terminal cabinets, junction boxes, pullboxes and device backboxes.

b. Conduit systems shall be dedicated to the fire protection system and shall contain no unrelated conductors.

c. All fire protection system conduits shall be of the sizes and types specified.

1) All conduits shall be rigid galvanized steel, 19 mm diameter minimum, except for flexible metallic conduit used for whips to devices only, maximum length 2 m, 19 mm diameter minimum.

2) Conduits shall be sized according to the conductors contained therein. Cross sectional area percentage fill for fire alarm system conduits shall not exceed 40%.

d. All conduit systems shall be solidly attached to building structural members or permanent walls and routed and installed to minimize the potential for physical damage, either mechanical or by fire, and so as not to interfere with existing building systems, facilities or equipment, and to facilitate service and minimize maintenance.

e. Conduit, junction boxes, panels, electrical enclosures, relays and device backboxes shall be exposed in unfinished areas and concealed in walls, ceiling spaces, electrical shafts or closets, in finished areas, except as noted on the drawings. All exposed conduit penetrations of walls shall be provided with escutcheon plates on either side of the wall.

f. All conduit penetrations of walls, floors and ceilings shall be sealed around the conduit(s) by the Contractor, restoring the walls, floors and ceilings to their original condition, fire resistance and integrity. The Contractor shall be responsible for all patching and touch-up painting necessitated by the performance of his work.

g. All pull boxes, junction boxes and terminal cabinets shall be painted "fire engine red" prior to installation. The Contractor shall provide touch-up painting, of normally visible pull boxes, junction boxes and terminal cabinets prior to final acceptance testing.

h. All conduits shall be grounded by approved ground clamps.

i. End-of-line resistors for all alarm system circuits shall be rated at 1/2-watt minimum. All end-of-line resistors shall be mounted on terminal blocks.

j. All end-of-line resistors shall be within their own junction boxes. Junction boxes shall be wall mounted, 1.5 m above finished floor. Junction boxes covers shall be labeled with the letters "EOL."

3.11 FIRE PROTECTION SYSTEM CONDUCTORS

a. The requirements of this section apply to all fire protection system conductors, including all signaling line, initiating device, indicating appliance, releasing function, remote signaling, AC and DC power and grounding/shield drain circuits.

b. All conductors shall be:

1) New. Wire shall not have scrapes, nicks, gouges or crushed insulation.

2) Installed in conduit.

3) Continuous (except bare shield drain conductors) between devices and between devices and intermediary terminal cabinets.

c. Splices in conductors are specifically prohibited, except for soldered and taped splices in shield drain conductors, as necessary to maintain continuity of the shield between devices. All splices shall be mechanically secure before soldering.

d. All fire alarm system conductors shall be of the type(s) specified herein.

1) All conductors, except AC power conductors, shield drain conductors and grounding conductors, shall be solid copper or bunch tinned (bonded) stranded copper.

2) Stranded copper conductors are acceptable for AC power conductors, shield drain conductors and grounding conductors only.

e. All fire alarm conductor terminations, except splices in shield drain conductors, and including field connections to supervisory resistors, diodes, relays or other devices, shall be to numbered terminals or terminal strips and shall be readily accessible for inspection, service, testing and maintenance.

1) All fire alarm conductor terminations shall be within junction boxes, device backboxes, terminal cabinets, control panels or other suitable metal enclosures.

2) Terminals and terminal strips shall be suitable for the size and number of conductors connected to them.

3) Each conductor termination shall be uniquely numbered with durable plastic tags or uniquely identifiable by a combination of numbers and color codes. These conductor numbers shall be shown on the Contractor's record drawings (floor plans and detailed wiring diagrams) in a manner allowing ready identification of all conductor terminations.

4) Wire nuts are prohibited.

5) Where pigtail devices are factory provided with wires too short to be connected to terminal strips (i.e.: solenoids), such connections shall be soldered and taped.

f. All control panel wiring shall conform to the requirements of this section:

1) All control panel wiring shall be fully dressed and bundled with nylon tie wraps at 76 mm intervals. Bundled wiring shall be routed parallel to terminal strips within control panels, with individual conductors turned out at 90° angles to their associated terminal connections. AC power conductors shall be bundled and routed separately from low voltage conductors. A minimum 50 mm separation shall be maintained between AC power conductors and low voltage conductors wherever possible. All control cabinets shall be sized for the requirements of this section.

2) Control panels shall not be used as raceways. Conductors which do not terminate within a control panel shall not be routed through that control panel.

g. Fire alarm conductors shall be separated into four categories:

1) Low voltage circuits.

2) AC Power Circuits.

h. Each category of fire alarm conductors shall be installed in physically separated, dedicated conduits, and shall not interface with one another except at common associated control equipment. Fire alarm system conductors shall be further segregated as necessary to conform to the fire alarm system manufacturer's recommendations and as necessary to prevent electrical crosstalk between conductors installed in common conduits.

i. All fire alarm circuits shall be installed as non-power limited circuits in accordance with NFPA 72.

j. Conductors looped around terminals are prohibited.

k. Wire nut splices are prohibited.

l. T-tapping of circuits is prohibited.

m. All circuits shall be megger tested to the voltage rating of their insulation before final terminations are made.

3.12 OVERVOLTAGE AND SURGE PROTECTION

All fire alarm circuits shall be protected from power line surges and overvoltage. Fuses shall not be used for surge protection.

3.13 EMI/RF PROTECTION

a. All fire alarm control equipment, devices and wiring shall be protected against unwanted radiated electro-magnetic interference (EMI) and from the affects of audio and radio frequencies (RF) that can cause the transmission of spurious alarms.

b. The system shall be designed and installed so as to be unaffected (with all control cabinet faceplates installed) by the operation of handheld, portable radios of up to 5 watts, or portable cellular telephones of up to 1 watt, within 300 mm of any system component(s).

3.14 ASSISTANCE FROM FIRE ALARM PANEL MANUFACTURER

The contractor shall secure the services of a qualified technical representative of the manufacturer of the foam system control panel for assistance in making wiring connections and terminations.

3.15 UNDERGROUND PIPING SYSTEM FLUSHING

Before connecting underground piping system to building piping system, all underground piping shall be flushed to an approved location in accordance with NFPA 24. Proposed method for flushing shall be approved by the Contracting Officer at least 24 hours before flushing is to begin.

3.16 DISINFECTION

After all system components are installed and hydrostatic test(s) are successfully completed, each portion of the sprinkler system and supply main to be disinfected shall be thoroughly flushed with potable water until all entrained dirt and other foreign materials have been removed before introducing chlorinating material. Flushing shall be conducted by removing the flushing fitting of the cross mains and of the grid branch lines, and then back-flushing through the sprinkler main drains. The chlorinating material shall be hypochlorites or liquid chlorine. Water chlorination procedure shall be in accordance with AWWA M20. The chlorinating material shall be fed into the sprinkler piping at a constant rate of 50 parts per million (ppm). A properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or liquid chlorine injected into the system through a solution-fed chlorinator and booster pump shall be used. Chlorination application shall continue until the entire system if filled. The water shall remain in the system for a minimum of 24 hours. Each valve in the system shall be opened and closed several times to ensure its proper disinfection. Following the 24-hour period, no less than 25 ppm chlorine residual shall remain in the system. The system shall then be flushed with clean water until the residual chlorine is reduced to less than one part per million. Samples of water in disinfected containers for bacterial examination will be taken from several system locations which are approved by the Contracting Officer. Samples shall be tested for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA EWW. The testing method shall be either the multiple-tube fermentation technique or the membrane-filter technique. The disinfection shall be repeated until tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted until satisfactory bacteriological results have been obtained. After the successful completion, remove all sprinklers or plugs and gravity flush all drops or trapped piping.

3.17 PIPE COLOR CODE MARKING

Color code marking of piping shall be as specified in Section 09900 PAINTS AND COATINGS.

3.18 TESTING

3.18.1 General Requirements

a. All system testing shall be conducted in accordance with approved test protocols prepared by the Contractor. Written test protocols including detailed test procedures, documentation sheets and expected test results shall be submitted to the Contracting Officer within 60 days of award of contract.

b. Upon completion and prior to acceptance of the installation, the Contractor shall subject the system to all tests required by NFPA 13 and NFPA 409, and shall furnish the Contracting Officer with a certificate as required thereof.

c. The Contractor is required to plan and schedule testing to meet all other building requirements. The Contractor shall schedule the final acceptance tests with Contracting Officer, at least 15 working days prior to the start of the final acceptance tests.

d. The Contractor shall furnish at his expense all materials, equipment, and personnel to conduct the tests including items to gain access, measure, or observe specific operations in the test.

e. The Contractor shall clean and restore all systems and areas to normal conditions after completion of tests. The Contractor shall dispose of all HEF foam by breaking it down with water. The Contractor shall follow both local and state EPA requirements.

f. Required tests shall be scheduled to coincide with work in progress to assure all tests have been completed by the time the project is completed.

g. HEF concentrate tests and fire alarm system tests shall be performed by qualified manufacturer's representatives.

h. The Contractor shall provide the HEF concentrate for testing. The Contractor shall provide all HEF concentrate associated with retesting, if test results are not acceptable. After successful completion of all tests, the Contractor shall refill the HEF tanks to full capacity with HEF concentrate. The HEF concentrate piping between the tanks and the automated HEF concentrate valves shall also be filled with HEF concentrate after the final testing.

i. All final acceptance tests will be witnessed by the Contracting Officer and/or appointed representatives.

3.18.2 Preliminary Contractor Testing

a. Prior to final acceptance testing of the installation, the Contractor shall as a minimum, conduct the following tests:

1) Flushing and hydrostatic tests, above and below grade piping, per requirements of NFPA 24 and NFPA 13.

2) HEF solution concentration testing.

3) Meggering of all circuits before final terminations are made. The Contractor shall provide a megger test report prior to final terminations.

4) Testing of all fire detection and alarm circuits for supervisory and trouble conditions.

5) Setting and adjusting of all valve supervisory (tamper) switches.

6) Fire alarm and control system testing.

7) Main drain flow test.

b. The Contractor may conduct other tests to assure that the systems are ready for final acceptance testing. As deficiencies are corrected, retesting shall be performed to assure the systems have no deficiencies.

c. Test Reports

1) A letter from the Contractor certifying successful completion of the required Contractor tests shall be supplied to the Contracting Officer at least 10 working days prior to the final acceptance testing. The letter shall state that all the installed systems are complete, fully tested and ready for final acceptance testing.

2) The Contractor shall submit a test report in booklet form to the Contracting Officer with the letter certifying completion of Contractor tests. The report shall describe all tests conducted and the results of the tests.

3.18.3 Final Acceptance Tests

a. The Contracting Officer and/or designated representatives shall observe all tests.

b. No final acceptance testing shall be conducted prior to the successful completion of all Contractor tests.

c. All final acceptance tests shall be conducted on a continuous, consecutive day basis.

d. The final acceptance tests shall consist of the following tests as specified, and shall provide a complete demonstration of the operation of the system:

1) HEF solution concentration testing.

2) Complete functional testing of all mechanical components.

3) Discharge test of the HEF system.

4) Fire alarm and control system testing.

e. The Contractor shall submit a final acceptance test report in booklet form to the Contracting Officer. The report shall describe all tests conducted and the results of the tests.

3.18.4 Flushing and Hydrostatic Pressure Tests (Contractor Test)

a. All piping shall be flushed at no less than 3.1 m/s.

b. All systems shall be hydrostatic tested at not less than 1.4 MPa for two hours. The test pressure shall be read from a gage at the low elevation of the system. No leakage is permissible.

c. The Contractor shall measure and record the flow rates and pressures.

3.18.5 Main Drain Flow Test (Contractor Test and Final Acceptance Test)

Following flushing of the underground piping, a main drain test shall be made to verify the adequacy of the water supply. Static and residual pressures shall be recorded on the certificate specified in paragraph SUBMITTALS. In addition, a main drain test shall be conducted each time after a main control valve is shut and opened.

3.18.6 HEF Solution Concentration Test (Contractor Test and Final Acceptance Test)

a. The following minimum items shall be provided by the Contractor:

1) Three (3) 100 mL graduated tubes.

2) Two (2) measuring pipettes (10 mL capacity).

3) One (1) hand refractometer - Reichert catalog number 10419. No "or equal" product substitutions are acceptable.

b. Test Procedures:

1) Draw samples of HEF concentrate and water from the system in separate clean containers. HEF concentrate shall be drawn from the HEF concentrate storage tank.

2) Mix five (5) control sample solutions of HEF and water with the following concentrations:

a) 0% (water only)

b) 0.75%

c) 1.75%

d) 2.75%

e) 3.75%

f) 4.75%

3) Determine refractometer reading for each control sample solution listed above. Record these refractometer readings.

4) Compare recorded control sample solution refractometer reading with readings obtained from nozzle test sample solutions of HEF and water.

5) The test concentrations shall be within the limits of 91% to 116% of the design concentration of 2.75%.

6) Any test concentrations that are above or below the specified limits constitute test failure. This voids any other successful concentration tests. The Contractor shall repeat the Contractor concentration tests until successful. A new HEF solution concentration test shall be required for final acceptance.

7) Temperature of the test or control samples shall not be considered a factor in determining the accuracy of the HEF proportioning.

8) Test sample collection, control sample preparation and all refractometer readings shall be witnessed and verified by a representative of the Contracting Officer.

3.18.7 HEF Discharge Test (Final Acceptance Test)

a. The Contractor shall position a minimum of 8 measuring stands throughout the hangar, which are clearly marked at a height of 1 meter above floor level. Ladders are acceptable as test stands. The 1 meter level shall be prominently marked so as to be easily observable from all areas of the hangar during the test.

b. The hangar doors shall be in the fully closed position at the start of the test. The fire pumps shall not be running at the start of the test. A fire pump is expected to start automatically when the test begins.

c. The Contractor shall start the test by initiating the HEF discharge using a manual HEF release station. The Contractor shall record the passage of time as the foam is discharged.

d. The HEF discharge shall continue until all measuring stands show a minimum of 1 m of foam depth in all areas of the hangar to the satisfaction of the Contracting Officer (or his designated representative). At that time, the Contractor shall halt the HEF discharge, and record the duration of HEF discharge in minutes and seconds.

e. Although a discharge time of 4 minutes is allowable per military design criteria, to pass the test of this specification the HEF system must accomplish the 1 meter minimum foam depth in a discharge duration time of 3 minutes or less.

f. If the HEF discharge duration time is greater than 3 minutes, the test shall be considered failed. In the event of a failed HEF discharge test, the Contractor shall modify the system and repeat the test until the system produces a passing result.

3.18.8 Fire Alarm and Control System Testing (Contractor Test and Final Acceptance Test)

a. System testing shall include operational and supervisory testing of all control equipment, annunciation devices, HEF manual release stations, HEF manual abort stations, launch mode stations, indicating appliances, remote signaling apparatus, solenoids, pressure switches, valve tamper switches, auxiliary functions, system wiring, and power supplies.

b. During the course of this testing, all input and output features of the fire detection and supervisory alarm system are to function as indicated on the input/output matrix of the contract drawings. Proper operation of all equipment is to be verified through this testing.

c. Receipt of all alarm and trouble signals initiated during the course of testing shall be verified at the fire alarm control panel.

d. Correct labeling of all fire alarm control panel annunciation shall be verified.

e. 100% successful performance during Final Acceptance Testing is expected. In the event of system performance inconsistent with the Contractor's letter of system certification, the Contracting Officer will make a determination as to whether or not the test results constitute failure of the final acceptance test. Failure of the final acceptance test shall invalidate the Contractor's letter of system certification, in which case recertification (including 100% Contractor retesting) and a repeat of the final acceptance test shall be required at no additional cost to the Government.

3.19 TRAINING

3.19.1 Operator Training

The Contractor shall conduct two (2) training sessions of four (4) hours each to familiarize Government personnel with the features, operation and maintenance of the HEF and other fire protection/alarm systems. Training sessions shall be scheduled by the Government at a time mutually agreeable to the Contractor and the Government.

3.19.2 Training Agenda

The Contractor shall submit a proposed training agenda for the Government's review and approval within 60 days of authorization to proceed. The proposed training agenda shall include the following:

a. Overview of system operation.

b. Overview of system equipment and device locations.

c. Manual controls (manual HEF discharge stations and valve operation).

d. Manual operation, testing and maintenance of deluge valves and the automated HEF concentrate valve.

e. FSCP and fire alarm panel(s).

f. Audio/visual signals (speakers, strobes, alarm/trouble LED's, and buzzers).

g. User operation of control panel (alarm acknowledgment, alarm silence, reset, alarm resound).

h. Draining and filling procedures for the HEF tank.

i. Review of the Operation and Maintenance Manual

j. Detailed maintenance procedures.

k. Periodic testing procedures.

-- End of Section --

(End of Summary of Changes)